PAGE'S WEEKLY.—October 21, 1904.

NO. 6. VOL. 5.
(New Series. No. 2. Vol. I.)

SIXPENCE.

Friday,
October 21, 19

PAGE'S WEEKLY

ENGINEERING · ELECTRICITY
SHIPBUILDING MINING
IRON & STEEL INDUSTRIES

EDITORIAL & PUBLISHING OFFICES, CLUN HOUSE, SURREY STREET, STRAND, LONDON, W

FRANCE, Paris: 22, Rue de la Banque.
GERMANY, Berlin: 13, Unter den Linden.
RUSSIA, St. Petersburg: 14, Nevsky Prospect.
ITALY, Rome: 307 Corso.
AUSTRIA, Vienna: Kärntnerstrasse, nr, 30.

INDIA, Calcutta: Thacker, Spink & Co.
" Bombay: Thacker & Co., Ltd.
SOUTH AFRICA, Cape Town: Gordon & Gotch.
JAPAN, Yokohama: Kelly & Walsh, Ltd.
NEW ZEALAND: Gordon & Gotch, Ltd.

CANADA: Montreal News Company.
UNITED STATES, New York: International New
" Chicago: Subscription News Co.
AUSTRALIA, Melbourne: Gordon & Gotch.
STRAITS SETTLEMENTS, Singapore: Kelly & Wals

PAGE'S WEEKLY

Miscellaneous

BUYERS' DIRECTORY.

NOTE.—*The display advertisements of the firms mentioned under each heading can be found readily by reference to the Alphabetical Index to Advertisers on pages 23 and 25.*

In order to assure fair treatment to advertisers, each firm is indexed under its leading speciality ONLY.

Advertisers who prefer, however, to be entered under two or more different sections can do so by an annual payment of 5s. for each additional section.

Artesian Well Machinery.
John Z. Thom, Patricroft, Manchester.

Belting.
Binney & Son, Catherine Street. City Road, London, E.C.
Fleming, Birkby & Goodall, Ltd., West Grove, Halifax.
Rossendale Belting Co., Ltd.. 10, West Mosley Street, Manchester.

Boilers.
Clayton, Son & Co., Ltd., Leeds City Boiler Works, Leeds.
Grantham Crank & Iron Co., Ltd., Grantham.
John Thompson, Wolverhampton.

Boilers (Water-tube).
Babcock & Wilcox, Ltd., Oriel House, Farringdon Street, London, E.C.
Cochran & Co. (Annan), Ltd., Annan, Scotland.

Bolts, Nuts, Rivets, etc.
Herbert W. Periam, Ltd., Floodgate Street Works, Birmingham
T. D. Robinson & Co., Ltd., Derby.

Books.
E. & F. N. Spon, 125, Strand, London, W.C.

Cables.
St. Helen's Cable Co., Ltd., Warrington, Lancashire.

Case-Hardening Compounds.
Hy. Miller & Co.. Millgarth Works, Leeds.

Chucks.
Fairbanks Co., 78-80, City Road, London, E.C.

Clutches (Friction).
David Bridge & Co., Castleton Ironworks, Rochdale, Lancashire.
H. J. H. King & Co., Nailsworth, Gloucestershire.

Condensing Plant.
Concentric Condenser, Ltd., 23, Northumberland Avenue, London, W.C.
Mirrlees-Watson & Co., Ltd., Glasgow.

Consulting Engineers.
G. H. Hughes, A.M.I.M.E., 97, Queen Victoria Street, London, E.C.

Continental Railway Arrangements.
South Eastern & Chatham Railway Co.

Conveying and Elevating Machinery.
Adolf Bleichert & Co., Leipzig-Gohlis, Germany.
Brown Hoisting Machinery Co.. 39, Victoria Street, London, S.W.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Graham, Morton & Co., Ltd.. Leeds.
Temperley Transporter Co., 72, Bishopsgate Street Within, London, E.C.

Coverings (Boiler)
Magnesia Coverings, Ltd., Washington Station, co. Durham,

Cranes, Travellers, Winches, etc.
Joseph Booth & Bros. Ltd, Rodley, Leeds.
Thomas Broadbent & Sons, Ltd., Huddersfield.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Cranks.
Clarke's Crank & Forge Co., Ltd., Lincoln, England.

Cutters (Milling).
E. G. Wrigley & Co., Ltd., Foundry Lane Works, Soho, Birmingham.

Destructors.
Horsfall Destructor Co., Ltd., Armley, Leeds.

Dredges and Excavators.
Delange & Cie, Mce., Hob oken, near Antwerp.
Lobnitz & Co., Ltd., Renfrew.
Rose, Downs & Thompson, Ltd., Old Foundry, Hull.

Economisers.
E. Green & Son, Ltd., Manchester.

Ejectors (Pneumatic).
Hughes & Lancaster, 47, Victoria Street, London, S.W.

Electrical Apparatus.
Allgemeine Elektricitäts Gesellschaft, Berlin, Germany.
Broadbent, T. W., Victoria Electrical Works, Huddersfield.
Bruce Peebles & Co., Ltd., Edinburgh.
Brush Electrical Engineering Co., Ltd., Victoria Works, Belvedere Road, London, S.E.
Crompton & Co., Ltd., Arc Works, Chelmsford.
Crypto Electrical Co., 3, Tyer's Gateway, Bermondsey Street, London, S.E.
Gent & Co., Ltd., Faraday Works, Leicester.
Greenwood & Batley, Ltd.. Albion Works, Leeds.

Electrical Apparatus—(*Continued*).
The India Rubber, Gutta Percha, and Telegraph Works Co., Ltd., Silvertown, London, E.
Mather & Platt, Ltd., Salford Iron Works, Manchester.
Matthews & Yates, Ltd., Swinton, Manchester.
Mix and Genest, Berlin, W., Germany.
Nalder Bros. & Thompson, 34. Queen Street, London, E.C.
Newton Brothers, Full Street, Derby.
Phœnix Dynamo Manufacturing Co., Bradford, Yorks.
Premier Electrolyte Co., 26, Spital Square, London, E.
Simplex Steel Conduit Co., Ltd., 20, Bucklersbury, London, E C.
Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.
Turner, Atherton & Co., Ltd., Denton, Manchester.
B. Weaver & Co., 22, Rosoman Street, Clerkenwell, London, E.C.

Engines (Electric Lighting).
J. & H. McLaren, Midland Engine Works ,Leeds.

Engines (Locomotive).
Baldwin Locomotive Works, Philadelphia, Pa., U.S.A.
Hunslet Engine Co., Ltd., Leeds, England.
Hudswell, Clarke & Co., Ltd., Leeds, England.

Engines (Stationary).
Allis-Chalmers Co., 533, Salisbury House, Finsbury Circus, London, E.C.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Momentum Engine, 19, 19a, Imperial Buildings, Ludgate Circus, London, E C.

Engines (Traction).
Jno. Fowler & Co. (Leeds), Ltd., Steam Plough Works, Leeds.
Garrett & Sons, Ltd., Richard, Leiston, R.S.O., Suffolk.

Engravers.
Jno. Swain & Son, Ltd., 58, Farringdon Street, London, E.C.

Fans, Blowers.
Davidson & Co., Ltd., "Sirocco" Engineering Works, Belfast, Ireland.
James Keith & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.
Matthews & Yates, Ltd., Swinton, Manchester.

Fire Bricks.
J. H. Sankey & Son, Ltd., Essex Wharf, Canning Town, London, E.
E. J. & J. Pearson, Ltd., Stourbridge.

Firewood Machinery.
M. Glover & Co., Patentees and Saw Mill Engineers, Leeds.

Fountain Pens.
Mabie, Todd & Bard, 93, Cheapside, London, E.C.

Forging (Drop) Plants.
Brett's Patent Lifter Co., Ltd., Coventry.

Forgings (Drop).
J. H. Williams & Co., Brooklyn, New York, U.S.A.

Furnaces.
Deighton's Patent Flue & Tube Company, Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.
W. F. Mason, Ltd., Engineers, Manchester.
Poetter & Co., 116, Victoria Street, London, S.W.

Gas Producers.
W. F. Mason, Ltd., Engineers, Manchester.
Power-Gas Corporation, Ltd., 39, Victoria Street, London, S.W.

Gears.
Buffoline Noiseless Gear Co., Levenshulme, Manchester.

Gold Dredging Plant.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.

Gauge Glasses.
J. B. Treasure & Co., Vauxhall Road, Liverpool.

Hammers (Steam).
Davis & Primrose, Leith Ironworks, Edinburgh.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Hoisting Machinery.
See Conveying Machinery.

Horizontal Boring Machines.
William Asquith, Ltd., Highroad Well Works, Halifax.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Icemaking and Refrigerating Machinery.
H. J. West & Co., 114-118, Southwark Bridge Road, London. S. E,

Indicators.
Dobbie McInnes, Ltd., 41 & 42, Clyde Place, Glasgow

PAGE'S WEEKLY Weighing Machines

BY ROYAL WARRANT TO H.M. THE KING

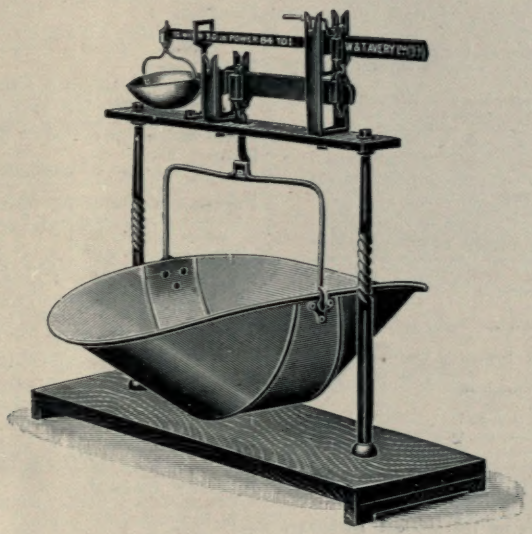
W. & T. AVERY, Ltd.

THE LARGEST WEIGHBRIDGES

EST^D 1730 SOHO FOUNDRY BIRMINGHAM

MAKERS OF IN THE WORLD

Avery's Computing and Counting Balances.



Reduces the Wages Cheques in Factories!

INDISPENSABLE IN MANUFACTORIES

for counting large quantities of Articles, Checking Men's Work, Stock-taking, or for making into Grosses, etc.

ESTIMATING BALANCES

Are a necessity for Estimating and Counting Offices, for ascertaining the weight of quantities of Articles from the weight of one Article.

Write for Illustrated Price List of

AVERY'S COMPUTING BALANCES.

A 2

Buyers' Directory—(*Continued*).

Iron and Steel.
Askham Bros. & Wilson, Ltd., Sheffield.
Consett Iron Co., Ltd., Consett, Durham, and Newcastle-on-Tyne.
Fairley & Sons, James, Old Mint, Shadwell Street, Birmingham.
Farnley Iron Co., Ltd., Leeds England.
Fried. Krupp, Grusonwerk, Magdeburg-Buckau, Germany.
Hadfield's Steel Foundry Co., Ltd., Sheffield.
J. Frederick Melling, 14, Park Row, Leeds, England.
Parker Foundry Co., Derby.
Purden, John & Sons, Lambhill Forge, by Maryhill, Glasgow.
Walter Scott, Ltd., Leeds Steel Works, Leeds, England.
Gilbert Thompson & Co., 116, Victoria Street, London, S.W.
Woodhouse & Rixson, Sheffield.

Jointing Materials.
Richard Klinger & Co., 66, Fenchurch Street, London, E.C.

Laundry Machinery.
W. Summerscales & Sons, Ltd., Engineers, Phœnix Foundry, Keighley, England.

Lifts.
Waygood & Co., Ltd., Falmouth Road, London, S.E.

Lighting Apparatus.
United Kingdom Lighting Trust, Ltd., 99, Cannon Street, London, E.C.

Lubricants.
Blumann & Stern, Ltd., Plough Bridge, Deptford, London, S.E.
The Reliance Lubricating Oil Co., 19 & 20, Water Lane, Great Tower Street, London, E.C.
Matthew Wells & Co., Hardman Street Oil Works, Manchester.

Machine Tools.
George Addy & Co., Waverley Works, Sheffield.
Hy. Berry & Co., Ltd., Leeds.
Bertram's, Ltd., St. Katherine's Works, Sciennes, Edinburgh.
Breuer, Schumacher & Co., Ltd., Kalk, near Cologne-on-Rhine (Germany).
Britannia Engineering Co., Ltd., Colchester, England.
C. W. Burton Griffiths and Co., 1, 2, & 3, Ludgate Square, Ludgate Hill, London, E.C.
Chas. Churchill & Co., Ltd., 9-15, Leonard Street, London, E.C.
Cunliffe & Croom, Ltd., Broughton Ironworks, Manchester.
Jones & Lamson Machine Co., 97, Queen Victoria Street, London, E.C.
John Lang & Sons, Johnstone, near Glasgow.
Luke & Spencer, Ltd., Broadheath, Manchester.
Jos. C. Nicholson Tool Co., City Rd. Tool Wks., Newcastle-on-Tyne.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.
Noble & Lund Ltd., Felling-on-Tyne.
Northern Engineering Co., 1900, Ltd., King Cross, near Halifax.
J. Parkinson & Son, Canal Ironworks Shipley, Yorkshire.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.
C. Redman & Sons, Halifax.
Rice & Co. (Leeds), Ltd., Leeds, England.
Wm. Ryder, Ltd., Bolton, Lancs.
G. F. Smith, Ltd., South Parade, Halifax.
John Stirk & Sons, Halifax.
Taylor and Challen, Ltd., Derwent Foundry, Constitution Hill, Birmingham.
H. W. Ward & Co., Lionel Street, Birmingham.
T. W. Ward, Albion Works, Sheffield.
West Hydraulic Engineering Co., 23, College Hill, London, E.C.
Whitman & Barnes Manufacturing Co., 149, Queen Victoria Street, London, E.C.
Charles Winn & Co., St. Thomas Works, Birmingham.
Yorkshire Machine Tool and Engineering Works, Liversedge, Yorks.

Machinery Valuer.
John Hardisty, M.I.C.E., M.I.M.E., 10, Independent Buildings, Fargate, Sheffield.

Metals.
Delta Metal Co., Ltd., 110, Cannon Street, London, E.C.
Magnolia Anti-Friction Metal Co., Ltd., of Great Britain, 49, Queen Victoria Street, London, E.C.
Phosphor Bronze Co., Ltd., Southwark, London, S.E.

Metals (Perforated).
W. Barns & Son, Chalton Street, Euston Road, London, N.W.

Mining Machinery.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Hardy Patent Pick Co., Ltd., Sheffield.
Humbolt Engineering Co., Kalk, Nr. Cologne, Germany.

Office Appliances.
Halden & Co., J., 8, Albert Square, Manchester.
Hall & Co., B. J., 39, Victoria Street, London, S.W.
Library Supply Co., Bridge House, 181, Queen Victoria Street, London, E.C.
Lyle Co., Ltd., Harrison Street, Gray's Inn Road, London, W.C.
Partridge & Cooper, Ltd., 191-192 Fleet Street, London, E.C.
Rayward Bros., 81, Queen Victoria Street, London, E.C.
Rockwell-Wabash Co., Ltd., 69, Milton Street, London, E.C.
Shannon, Ltd., Ropemaker Street, London, E.C.
Stolzenberg (Patent) File Co., 50, Bishopsgate Street Without, London, E.C.
The Trading and Manufacturing Co., Ltd., Temple Bar House, Fleet Street, London, E.C.

Oils, &c.
Wells, M., & Co., Hardman Street Oil Works, Manchester.

Packing.
Beldam Packing & Rubber Co., 93-94, Gracechurch Street, London, E.C.
Frictionless Engine Packing Co., Ltd., Hendham Vale Works, Harpurhey, Manchester.
Lancaster & Tonge, Ltd., Pendleton, Manchester.
The Quaker City Rubber Co., 101, Leadenhall Street, London, E.C.
United Kingdom Self-Adjusting Anti-Friction Metallic Packing Syndicate, 14, Cook Street, Liverpool.
United States Metallic Packing Co., Ltd., Bradford,
J. Bennett von der Heyde, 6, Brown Street, Manchester.

Paint (Metallic).
Metallic Paint Co., Ltd., Cardiff.

Paper.
Lepard & Smiths, Ltd., 29, King Street, Covent Garden, London, W.C.

Patent Agents.
Page & Rowlingson, 28, New Bridge Street, London, W.C.

Photo Copying Frames.
J. Halden & Co., 8, Albert Square, Manchester.
B. J. Hall & Co., 39, Victoria Street, London, S.W.

Photographers.
Booker & Sullivan, 67 and 69, Chancery London, W.C.
Elliott & Fry, 55, Baker Street, London, W.

Photographic Apparatus.
Marion & Co., Ltd., 22, 23, Soho Square, London, W.

Pinch Bars.
Samson & Co., Garforth, near Leeds.

Pistons.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Porcelain.
Gustav Richter, Charlottenburg, near Berlin, Germany.

Presses (Hydraulic).
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Printing.
Southwood, Smith & Co., Ltd., Plough Court, Fetter Lane, London, E.C.

Publishers.
Crosby Lockwood & Son, 7, Stationers' Hall Court, London, E.C.
Gresham Publishing Co., 34, Southampton Street, Strand, London, W.C.
Charles Griffin & Co., Ltd., Exeter Street, Strand, London, W.C.
New Zealand Mines Record, Wellington, New Zealand.

Pulleys.
H. J. H. King & Co., Nailsworth, Glos.

Pumps and Pumping Machinery.
Blake & Knowles Steam Pump Works, Ltd., 179, Queen Victoria Street, London, E.C.
Drum Engineering Co., 27, Charles Street, Bradford.
Enke, Carl, Schkeuditz-Leipzig, Germany.
Fairbanks, Morse & Co., 126, Southwark Street, London, S.E.
Fraser & Chalmers, Ltd., 3, London Wall Buildings, London, E.C.
Hathorn, Davey & Co., Ltd., Leeds, England.
Positive Rotary Pumps, Ltd., 23, Northumberland Avenue, London, W.C.
Tangyes, Ltd., Cornwall Works, Birmingham.

Radial Drilling Machines.
William Asquith, Ltd., Highroad Well Works, Halifax.
Niles-Bement Pond Co., 23-25, Victoria Street, London, S.W.

Rails.
Wm. Firth, Ltd., Leeds.

Railway Wagons.
Nye, A. W., 110, Cannon Street, London, E.C.
W. R. Renshaw & Co., Ltd., Phœnix Works, Stoke-on-Trent.

Riveted Work.
F. A. Keep, Juxon & Co., Forward Works, Barn Street, Birmingham.

Roof Glazing.
Mellowes & Co., Sheffield.

Roofs.
D. Anderson & Son, Ltd., Lagan Felt Works Belfast.
Alex. Findlay & Co., Ltd., Motherwell, N.B.
Head, Wrightson & Co., Ltd., Thornaby-on-Tees.

Ropeways (Aerial).
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.

Scientific Instruments.
Cambridge Scientific Instrument Co., Ltd., Cambridge.

Stampings.
Thos. Smith's Stamping Works, Ltd., Coventry.
Thomas Smith & Son of Saltley, Ltd., Birmingham.

Stamps (Rubber).
Rubber Stamp Co., 1 & 2, Holborn Buildings, Broad Street Corner Birmingham.

Stamps (Metal).
Edward Pryor & Son, 68, West Street, Sheffield.

Steam Traps.
British Steam Specialties, Ltd., Fleet Street, Leicester.
Lancaster & Tonge, Ltd., Pendleton, Manchester.

Steam Wagons.
Thornycroft & Co., Ltd., J. I., Chiswick, London, W.
Yorkshire Patent Steam Wagon Co., Pepper Road, Hunslet, Leeds.

Buyers' Directory—(*Continued*).

Steel Tools.
Saml. Buckley, St. Paul's Square, Birmingham.
Pratt & Whitney Co., 23-25, Victoria Street, London, S.W.

Stokers.
Ed. Bennis & Co., Ltd., Bolton, Lancs.
Meldrum Brothers, Ltd., Atlantic Works, Manchester.

Stone Breakers.
S. Pegg & Son, Alexander Street, Leicester.

Superheaters.
A. Bolton & Co., 40, Deansgate, Manchester.

Time Recorders.
Howard Bros., 10, St. George's Crescent, Liverpool, and 100c, Queen Victoria Street, London, E.C.
International Time Recording Co., 171, Queen Victoria Street, London, E.C.

Tubes.
remier Boiler Tubes, Ltd., 28, Victoria Street, London, S.W.
Thomas Piggott & Co., Ltd., Spring Hill, Birmingham.
Tubes, Ltd., Birmingham.

Turbines.
G. Gilkes & Co., Ltd., Kendal.
S. Howes, 64, Mark Lane, London, E.C.

Typewriters.
Elliott-Fisher Co., 85, Gracechurch Street, London, E.C.
Empire Typewriter Co., 77, Queen Victoria Street, London, E.C.
Yost Typewriter Co., 50, Holborn Viaduct, London, E.C.

Valves.
Alley & MacLellan, Ltd., Glasgow.
Holmes & Co., W. C., Huddersfield.
Scotch and Irish Oxygen Co., Ltd., Rosehill Works, Glasgow.
Shaw, Joseph, Albert Works, Huddersfield.

Ventilating Appliances.
Matthews & Yates, Ltd., Swinton, Manchester.

Wagons—Steam.
Thornycroft Steam Wagon Co., Ltd., Homefield Chiswick, London, W.

Water Softeners.
Lassen & Hjort, 52, Queen Victoria Street, London, E.C.

Weighing Apparatus.
W. T. Avery & Co., Soho Foundry, Birmingham, England.
Samuel Denison & Son, Hunslet Moor, near Leeds.

Wells Light.
A. C. Wells & Co., 100A Midland Road, St. Pancras London, N.W.

Wire Working Machinery.
Ed. Brand, 35, Shakespeare Street, Manchester.

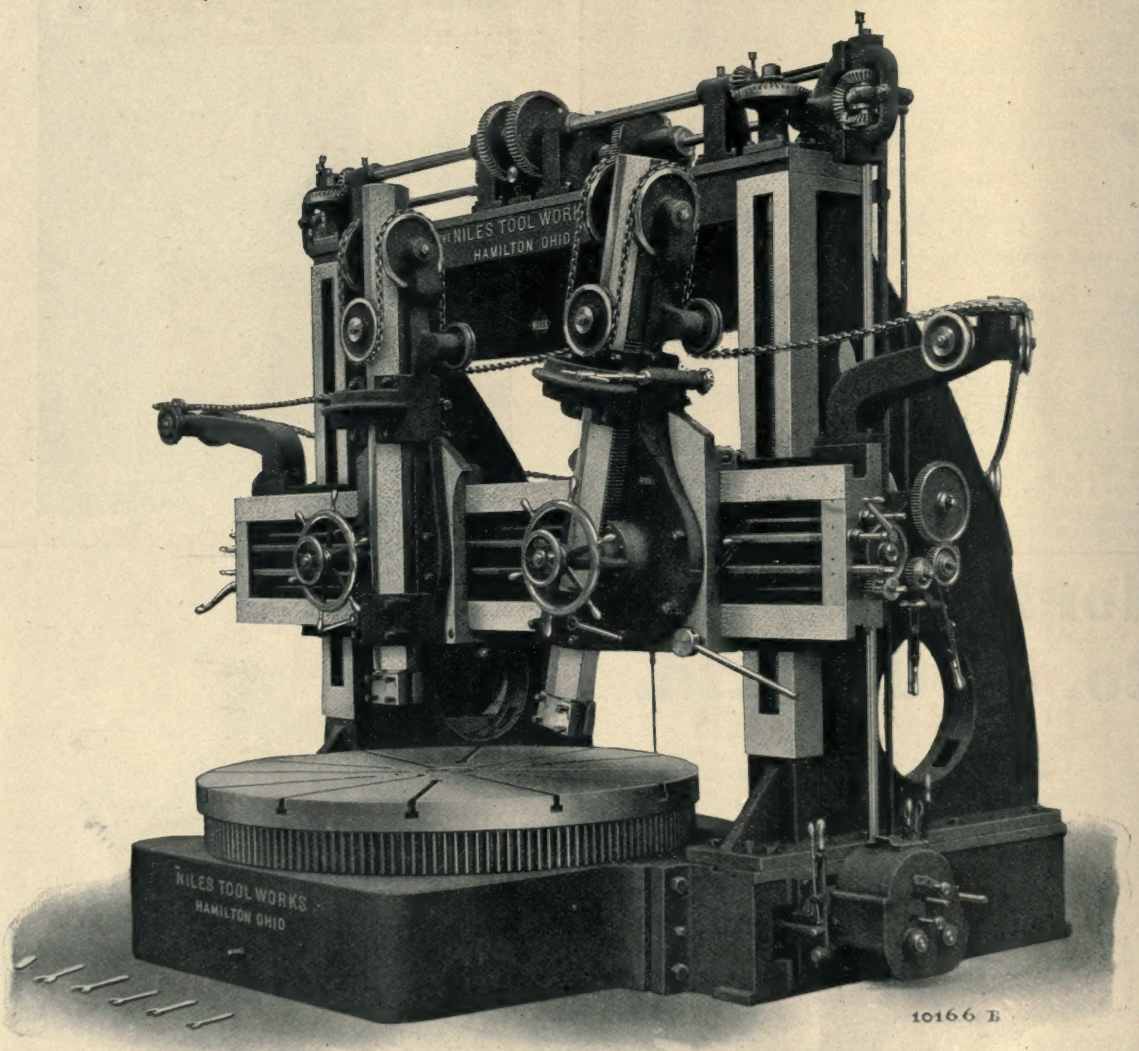
"Woodite."
"Woodite" Company, Mitcham, Surrey

MISCELLANEOUS

PAGE'S WEEKLY — Machine Tools

NILES' NEW TEN FOOT BORING AND TURNING MILL

FOR USE WITH MODERN HIGH-POWER TOOL-STEELS.



Nested Gear feeds to Bars independent in rate and direction.

Visit our Exhibit, Blocks 17 to 25, World's Fair, St. Louis, U.S.A.

NILES-BEMENT-POND CO.,

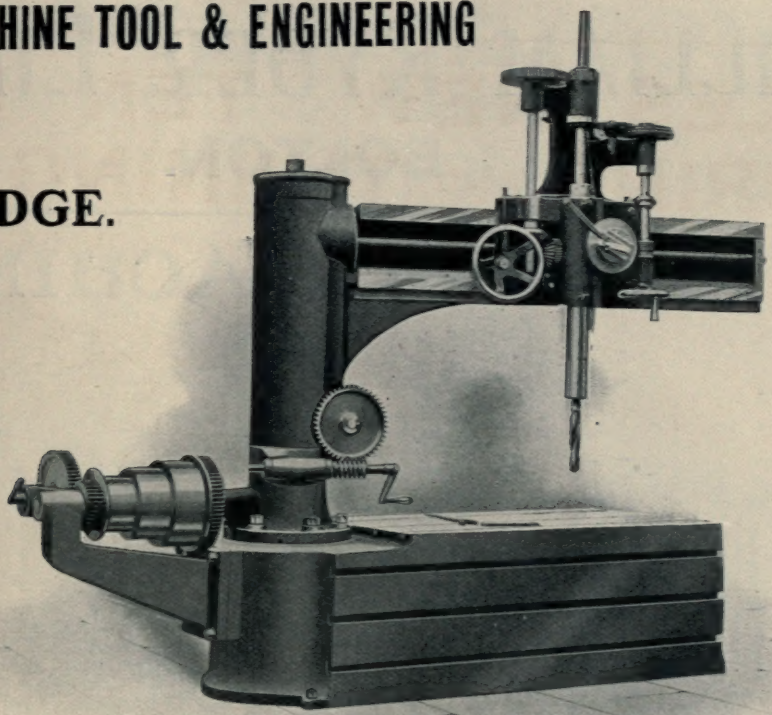
Telegrams—
NILESCO, NEW YORK.
NILIACUS, LONDON.

23-25, Victoria Street, LONDON, S.W.
136-138, Liberty Street, NEW YORK, U.S.A

PAGE'S WEEKLY — Machine Tools

YORKSHIRE MACHINE TOOL & ENGINEERING WORKS,

LIVERSEDGE.

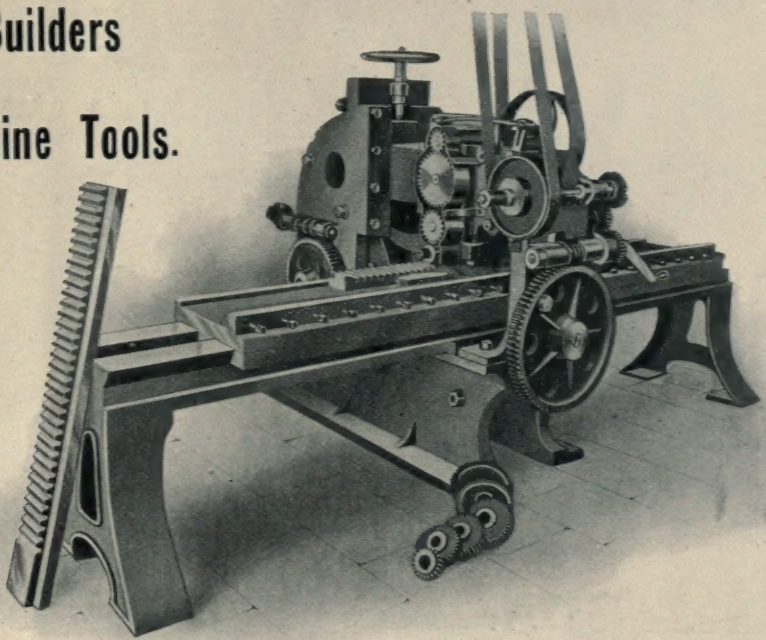


6 ft. arm High Speed Radial Dr.ll. Capacity, six ¾ holes through 1 in. plates per minute. 600 revolutions on drill. No belt feed.

Designers and Builders

OF . ,

High-Class Machine Tools.



Telegraphic Address
". Alma, Liversedge."

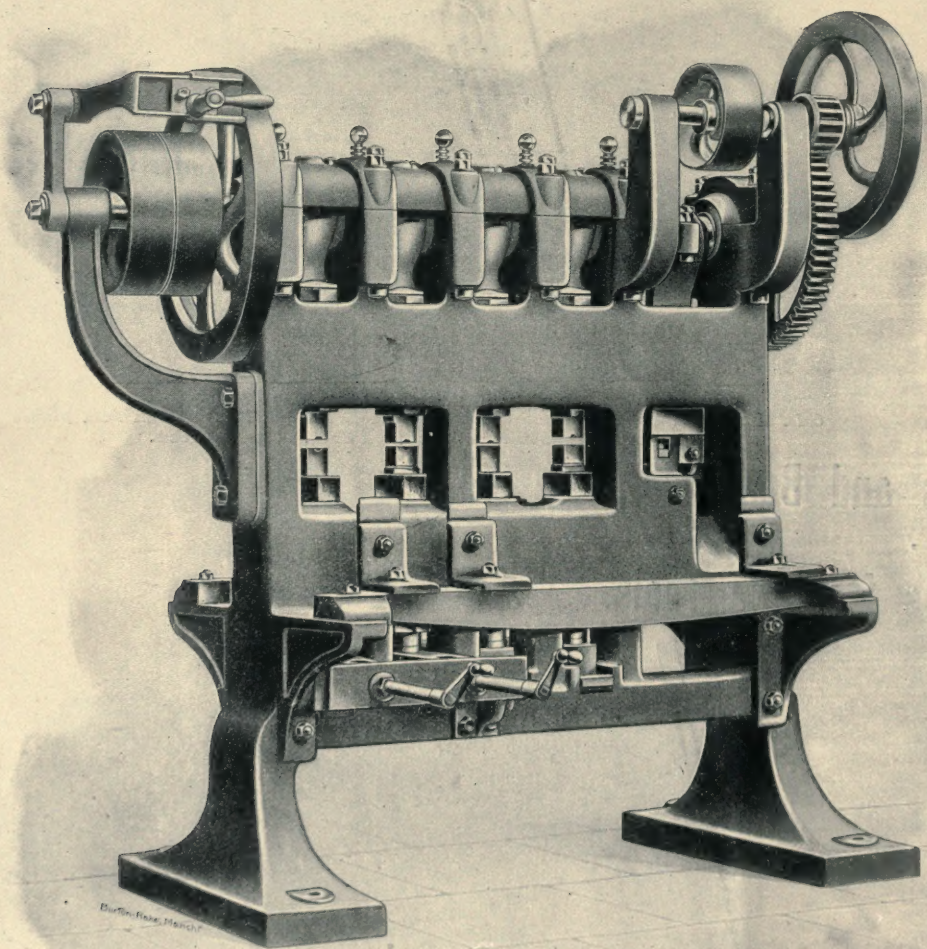
National Telephone:
No. 38 Heckmondwike.

Horizontal Rack Cutting Machine, entirely automatic, quick return to cutter. 8 in. and 10 in. Stroke Machines by 12 ft. long.

WILLIAM RYDER, LIMITED,

BOLTON.

FORGING MACHINES.



SAWING MACHINES.

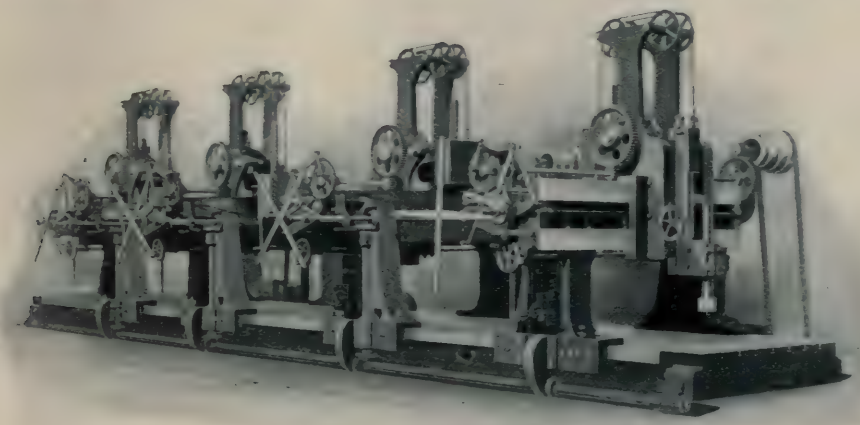
COKE BREAKERS.

PAGE'S WEEKLY — Machine Tools

JOHN STIRK & SONS,

MACHINE TOOL MAKERS,

(Established 1866.) **HALIFAX.**



Locomotive Frame-plate Slotting Machine (85 tons).

GILBERT THOMPSON & Co.,

IRON & STEEL WORK CONTRACTORS, STRUCTURAL ENGINEERS, &c. . .

London Representative :
Paul J. Mallmann, M.A.,
Civil Engineer.

Telegrams : "Mallmann, London."
Telephone No. : 5338 Westminster.

London Office :
116, Victoria Street,
Westminster, S.W.

SPECIALITY : POETTER'S GAS PRODUCING PLANT.

IRON AND STEEL WORK OF ALL KINDS
. IN . .
GIRDERS, COLUMNS,
BRIDGES, ROOFS,
BUILDINGS, FENCING, &c., &c.

DESIGNS AND ESTIMATES ON APPLICATION.

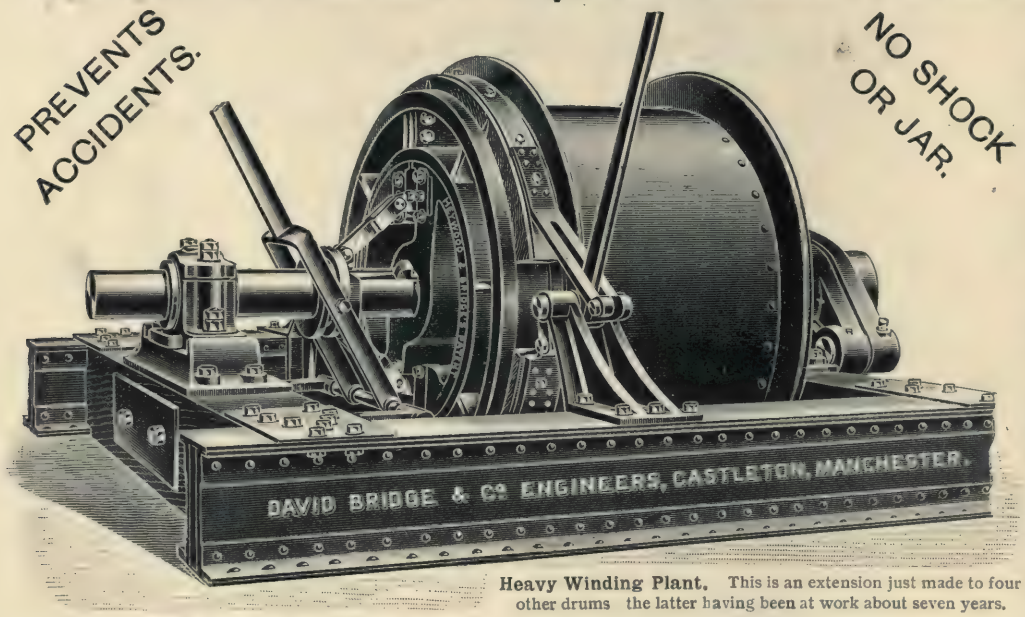
PROMPT DELIVERY AT LOWEST PRICES.

PAGE'S WEEKLY — Machine Tools

HEYWOOD & BRIDGE'S Improved Patent Friction Clutches.

PREVENTS ACCIDENTS.

NO SHOCK OR JAR.



Heavy Winding Plant. This is an extension just made to four other drums the latter having been at work about seven years.

Complete Clutch, Gearing and Hauling Plants our Speciality.

Send for Catalogues. FREE.

Quotations on application for Complete Plants.

Patentees and Sole Makers :—

DAVID BRIDGE & CO., Castleton Iron Works, Rochdale.

London Office: 35, QUEEN VICTORIA STREET, E.C.

Telegrams: "MILLING, SHEFFIELD." National Telephone No.: 985.

For the Latest and most Up-to-Date

HEAVY MACHINE TOOLS

PLATE BENDING MACHINE.

Also Special Lifting Jack for Electric Tramcars.

WRITE . . .

GEORGE ADDY & Co.,

WAVERLEY WORKS, SHEFFIELD.

SECTION OF "DRUM" PUMP.

THE . . .

"DRUM" PUMP.

JOHNSON'S PATENTS.

Write for Catalogue 63.

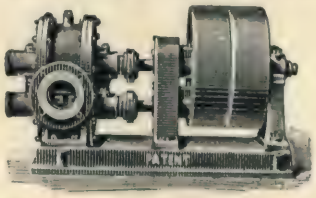
POSITIVE ACTION.
NO VALVES.
HIGH EFFICIENCY.

DRUM ENGINEERING CO.,

27, Charles St.,

BRADFORD.

ENKE'S ROTATIVE PUMP.



Best of all Systems for all Liquids.

4,000 Pumps under my System (with a capacity up to 15,000 litres per minute) in use.

ENKE'S PRECISION BLOWER.

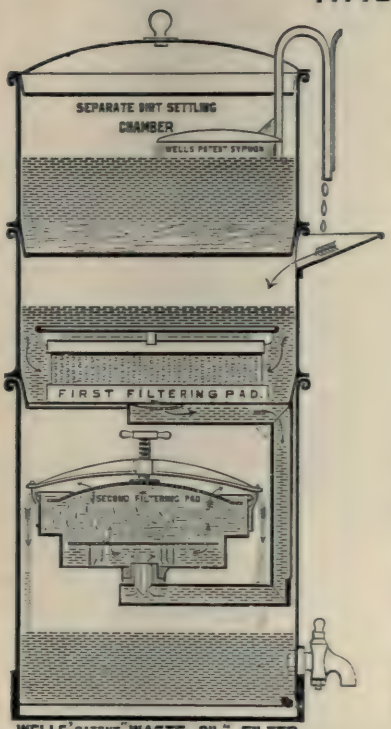
Entirely of Iron without packing for high pressures to 0·3 atm.

CARL ENKE, Schkeuditz-Leipzig, GERMANY.

PAGE'S WEEKLY — Wells' Specialities

WELLS' PATENT "Waste Oil" FILTERS

FITTED WITH SIGHT-FEED SYPHON.



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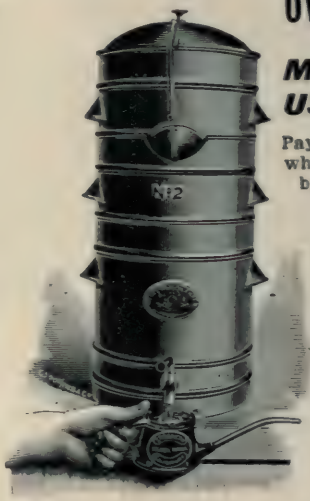

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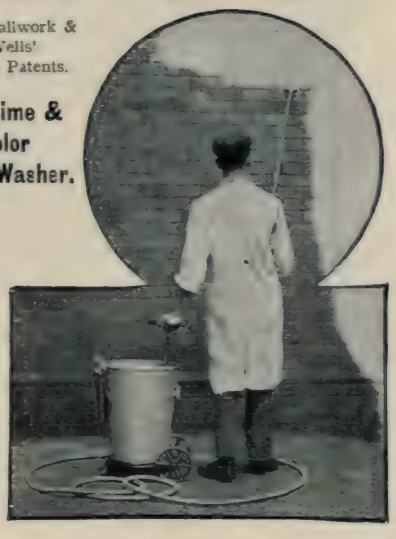

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PAGE'S WEEKLY — Belting

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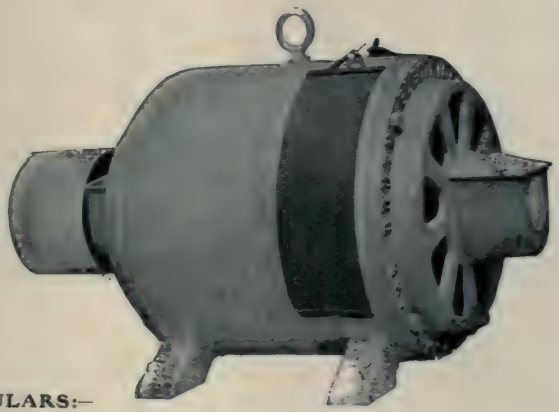

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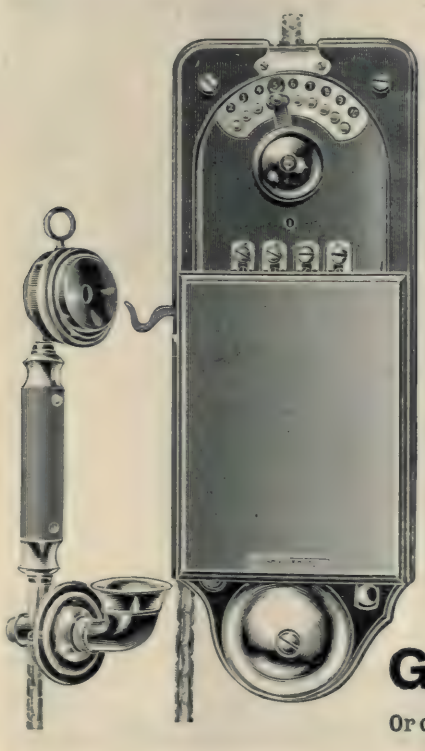

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Index to Advertisers.

Advertisements not appearing this week will be found by reference to the preceding or following issues, with the exception of those appearing monthly.

Index to Advertisers—(Contd.)

PAGE'S WEEKLY

Miscellaneous

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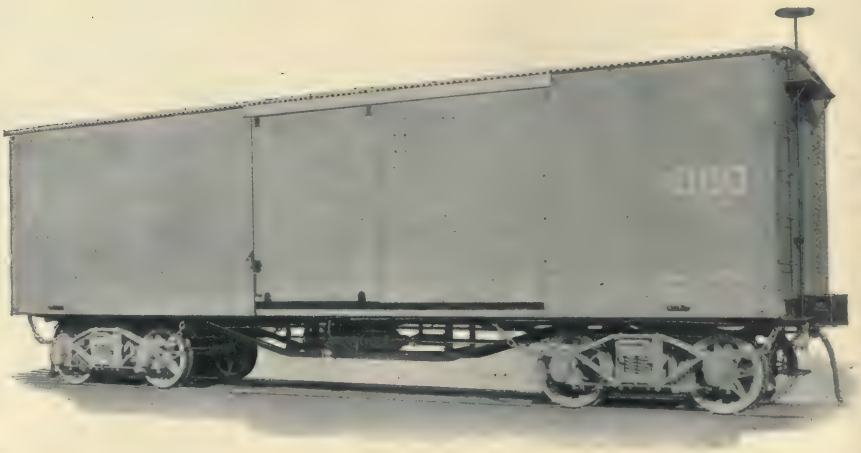

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PAGE'S WEEKLY

An Illustrated Technical Weekly, dealing with the Engineering, Electrical, Shipbuilding, Iron and Steel, Mining and Allied Industries.

Vol. V. LONDON, FRIDAY, OCTOBER 21, 1904. No. 6.

The Offices of "Page's Weekly,"
Wednesday, 11 p.m.

I AM very glad to have the opportunity of congratulating Admiral Sir John Fisher upon taking over to-morrow the duties of Senior Naval Lord. The appointment of a strong man to the premier position at the Admiralty will be welcomed by everyone who is ready to take a lesson from contemporary events. The naval side of the combat in the Far East has made it very obvious that the brain of a navy is its principal asset. Sir John Fisher is essentially a man of mentality, and, furthermore, he has gained the respect and confidence of the large majority of his countrymen, from His Majesty the King downwards. A born organiser, he has the happy knack of being able to come to the point in double-quick time. Whatever reforms this appointment may portend, one may be absolutely certain that every proposal will be treated strictly upon its merits, and that, if it is "common-sense" it will be done, and done smartly. A holy terror to shufflers and skulkers, Sir John Fisher is nothing if not thorough. By the reforms which he has already effected in the training of seamen, the First Lord has fully evidenced that mere superficiality will not suit him at all.

The modern British bluejacket, largely owing to his influence, has become a "handy man" indeed, as he is now something of a mechanic and a stoker as well as a gunnery and a torpedo man. Then, too, Admiral Fisher has already done most valuable service in reorganising the training of boys for the navy, and in originating the idea of the Naval Cadets College at Osborne. Perhaps the greatest tribute which could have been paid to his genius for organisation was his appointment upon the committee of three so recently delegated to produce a scheme of army reform. There is, however, plenty of work for him in his more legitimate sphere, and I venture to predict that Admiral Fisher will set his mark upon the British navy in a manner which will largely help to enhance its prestige, and increase its efficiency in war.

The struggle between Russia and Japan has given practical evidence of the important part which the telegraph (wireless or otherwise), telephone, and cables are playing in modern warfare. That veteran correspondent, Mr. Bennett Burleigh, in an admirable description of the battle of Liao-Yang, records that the Japanese Commander-in-Chief, Marshal Oyama, with a staff numbering sixty officers, sat on chairs on a green eminence smoking cigarettes as they watched and directed the movements. The Marshal was in constant communication by field telegraph and other wires with the Fourth

Army, under General Nodzu, and the First Army, under General Kuroki; and, further, he could talk over the wire to the besiegers at Port Arthur and to the Government in Tokio.

In the course of a paper on this subject, read at the International Electrical Congress, Major S. Reber, of the United States Army, showed that the use of electrical means of communication is now absolutely necessary to success in war, not only in the grand strategical combinations of a campaign, but also in the varying technical situations on the field of battle. The essential requirement is absolute certainty of service, independent of dictates of economy. The service of communication is separated into field and fortress work. The fortress system consists of the permanent lines, usually underground, the details of which are zealously preserved as Government secrets. For armies operating in the field a complete chain of communication should exist from the outposts to the main base of operation. By the use of light field cable and bare wire, a detached cavalry column can be connected during its movement with the main body. In the war of the future between two naval powers, the result will depend largely upon coal and cables.

If one looks for the causes which underlie the respective conditions of the two armies, they are easily found. Japan has a splendid system of education; in Russia the education of the masses is hampered alike by Church and State. In the rank and file of the two armies there is a different tone. Mr. Bennett Burleigh, in the report above alluded to, shows that the Japanese soldiers, though with little time to spare, are to be seen faithfully tubbing themselves whenever opportunity offers. No Japanese, either man or woman, of any class, ever goes a day without carefully brushing the teeth. In respect, at any rate, to personal cleanliness, they present the strongest possible contrast to the encamping Russian soldiers.

Reviewing the Russo-Japanese war down to the present time, and especially after the great battle of last week, which Marshal Oyama has called the battle of Sha-ho, one cannot escape the conclusion that the contest has become largely one of mind *versus* matter. Both countries possess brave troops, but Japan has the army with the best brain; her leaders have shown that they are adepts both in organisation and command. A Russian general recently stated the fundamental weakness of the Russian army as follows: "Men we have in plenty. What we lack is organisation and unity of conception. The chaotic conditions of the military administration in which our troops have been fighting since Monday are deplorable." The fact that the Japanese soldier cleans his teeth may not be so remotely connected with his ability to pare the bear's claws as at first sight may appear.

A document of more than ordinary importance has just been issued by the Institution of Mining and Metallurgy on the subject of "Miners' Phthisis." The council are anxious to secure the co-operation of the members of the Institution in the immediate adoption of effective methods of prevention, and in collecting further information as to the prevalence of the disease, and the conditions which give rise to it. There can now be little doubt that the main cause of this disease is the breathing of air containing stone-dust in suspension. The council, therefore, strongly urge upon members of the Institution the necessity of taking all practicable measures for keeping the air of mines free from dust, and preventing work being performed in places where dust is temporarily present in the air, as after blasting.

They recommend in particular that in rock drilling, water should be used in

[*Photo by Elliott and Fry*].

ADMIRAL SIR JOHN ARBUTHNOT FISHER, G.C.B.,

Who enters upon his duties as Senior Lord of the Admiralty to-morrow (Thursday).

such a way that no dust escapes into the air at any part of the operation, whether the hole be bored upwards or downwards; that the dust, after blasting, be either drowned down by water, removed by ventilation, or allowed to subside before the men return, and that, as far as possible, the rock broken be damped before removal. The council are taking steps to secure the co-operation of other technical societies in the collection of information, and they hope that members will assist by collecting and forwarding to the institution authentic information on the following points: 1. Frequency or infrequency of the disease in connection with different kinds of mining work and different varieties of rock; 2. Nature and amount of the stone-dust present in the air in different varieties of mining work; 3. Nature, amount, and effect on miners of the gaseous impurities met with in the air of metalliferous mines—in particular, poisonous impurities arising from blasting, etc.; 4. Means in actual use for preventing the formation and inhalation of dust or poisonous gases; 5. Evidence as to efficacy and practicability, or otherwise, of these means.

I hear to-day that Mr. B. H. Thwaite proposes to solve the problem by means of a suction apparatus, which he has invented. This will render it impossible for dust to enter the lungs of the miner, and at the same time will do away with one of the conditions favourable to ankylostomiasis.

In another part of this issue it will be noticed that Professor Redmayne again raises the much-debated question of a proposed amalgamation of the Institution of Mining Engineers and the Institution of Mining and Metallurgy. I would recommend this address to the careful attention of the members of both Institutions and would also call their attention to the interview (page 425) in which Mr. McDermid voices his views on this question.

Sir William H. Preece, writing to the Times on Tuesday, stigmatised the outcry against the submersion of the Philae ruins by reason of the heightening of the Assouan barrage, as so much "sentimental rot." He points out that the Philae temples are quite modern compared with those in Egypt. Visitors ascending the Nile become surfeited with Ptolemaic and Roman parodies of pure Egyptian culture, and irritated with the political morality which threw over the beauties of Greek arts to foster an effete and decaying civilisation. What is more ludicrous than a Roman Emperor posing as an Egyptian god? There is much that is beautiful in Philae, but nothing that is epoch-marking. The kiosk or Pharaoh's bed would be far more attractive if erected on the south end of Elephantine Island. The other temples can remain where they are. They will be seen at Low Nile. They will not be damaged by the full reservoir, but they will beautify a charming lake and a delightful boating resort.

If I had to answer Sir William's question as to what is more ridiculous than a Roman Emperor posing as an Egyptian god I would mention the statue of one of the Stuart Kings which, until recently, stood in a garden at Whitehall tricked out in a Roman toga. The question of the raising of the dam is so important that I am glad to see a trustworthy opinion as to the inconsequence of the proposed further submersion of the Philae monuments. After all, Egypt looks to the future as well as to the past.

The electrification of the Metropolitan District Railway will be sufficiently advanced to permit of the running of certain trains driven by electric power in January next. Trains will probably first be run from Ealing to the Mansion House, but the whole of the trains running over the District's lines may not be worked by electric power until the spring.

NEWS OF THE WEEK.

The Allis-Chalmers Company's Success.

I received a cablegram this morning from Mr. Arthur Warren, of the Allis-Chalmers Company, despatched last night from Milwaukee, U.S.A., stating that the Company's exhibit at the St. Louis Exposition had just been successful in obtaining the highest awards in steam, electricity, and mining engineering. These include three grand prizes and a gold medal. Visitors to the World's Fair will well remember that in the Machinery Hall and immediately opposite the main entrance to the north stands the large 5,000 h.p. Allis-Chalmers engine and Bullock electric generator, which form what is generally admitted to be one of the most notable exhibits in the Machinery building. This powerful steam-electric unit, in addition to being an exhibit of the Allis-Chalmers Company, is an important part of the operating plant of the Exposition, furnishing electric current for the decorative lighting of the exhibition grounds and buildings, and carrying nearly 200,000 eight-candle incandescent lamps. This load the engine takes in the evening, beginning at late dusk, and carries until the closing of the grounds.

Mr. Andrew Carnegie.

Mr. Andrew Carnegie has presented so many medals to distinguished metallurgists that it seems quite strange to think of him as the recipient of a gold medal. At the International Conference opening at New York on October 24th, however, the President of the Iron and Steel Institute will receive the Bessemer gold medal at the hands of Sir James Kitson, whose portrait I was enabled to reproduce last week. This honour will be paid to Mr. Carnegie in recognition of his serivces to the iron and steel industry. There is something quite dramatic about the way in which Andrew Carnegie hands over a medal; witness, for instance, his presentation to M. Breuil, in London, at the last meeting of the Institute. I shall not be at all surprised if he receives this medal with some characteristic remarks about bridging the Atlantic, and the unification of the great Anglo-Saxon race.

Mr. John Morley, who crossed the Atlantic in the company of Mr. and Mrs. Carnegie, is touring through Canada as well as the United States, and will be the guest of both of Sir Wilfred Laurier and President Roosevelt.

The President will receive Sir James Kitson and his colleagues of the Iron and Steel Institute at Washington on the 29th inst. The party includes Sir Walter Foster, M.P., Mr. E. P. Martin, Mr. Windsor Richards, and Mr. William Whitwell.

Sir William Ramsey on his American Tour.

Sir William Ramsey, after presiding over the annual meetings of the Society of Chemical Industry, at New York, and visiting the St. Louis Exhibition, again braved the Atlantic, and on landing at Liverpool the other day was promptly interviewed by the representative of an enterprising daily. Putting aside his remarks on the possibility of the elements having a common origin, and a train of speculations which bring us perilously near the "philosopher's stone," I turn with interest to his comments upon English and American technical education. Sir William appears to have been chiefly impressed by the constant and close touch which is maintained in the United States between the college and manufactory. Incidentally, he remarked that in our British technical schools we have thousands of evening students whose technical and scientific training does not go far enough. Instead of learning chemistry and engineering, they might as well be learning Italian or political economy, for any good the studies do them in their work. Of course the education is not lost; it is training the mind and improving the culture of the race, but it does not go far enough for any immediate commercial result. In America the training goes much further. Four or five years of all-day work are spent in the technical college, and the student knows his subject thoroughly when he enters on his after-career. Another thing that favours the increasing rise of highly trained scientific workers is the willingness of the American manufacturer to replace plant and adopt new experimental methods. Where money is being made quickly, and large fortunes await the discoverer of more advantageous systems of manufacture, there is a general readiness to spend liberally on experiments, and the efficiency of the scientific direction is of vital importance.

Proposed Tunnel under the Detroit River.

It is reported that a tunnel will probably be constructed by the Michigan Central Railroad, under the Detroit River, at Detroit, Mich. Representatives of the company have been investigating the tunnel work around New York, and a careful examination of the Detroit River bed is now being made. If the reports are as favourable as is anticipated the work will probably be commenced at an early date.

Forthcoming Electrical Exhibition in New York.

An Electrical Exposition is to be held at Madison Square Garden, New York City, from December 19th to the 28th, inclusive. This exposition is to be held under the patronage of the Electrical Contractors Association of New York City.

To Oppose the Metric System.

In connection with the efforts which are being made to replace our present arrangement of weights and measures by the Metric system, the British Weights and Measures Association is throwing the weight of its influence in the opposite scale. Its members give expression to the opinion that the enforcement of the metre in our empire would be a real calamity, and they give chapter and verse for this strong view. The Metric system cannot, it is pointed out, be applied to sea measures; moreover, it is not even in France the standard of measure in textile manufacture, the English standard being general indeed in other countries. It is added that English shipping measurements are universal, and that other nations are now growing used to the varying measures and weights employed in this country. Hence to introduce the metre now would be to create chaos where uniformity is being slowly reached. The advocates of the Metric system had better make an immediate reply.

An Electrical Club for Birmingham.

Under the presidency of Mr. S. W. Innis, a representative gathering of the Post Office, Telegraph Branch, the National Telephone Company the Municipal Technical School, Midland Railway, Telegraph Department, and general electrical industries met a few days ago in Birmingham for the purpose of considering the possibility of forming a club for members of the electrical and allied trades. Mr. Innis remarked that there had long existed a feeling that a club or institute should be promoted, the membership of which should be confined to those engaged in the manufacture and use of electrical apparatus and machinery. The basis principle of the club would be mutual, social and intellectual help to its members, and he thought that a club of this nature should prove very advantageous After several other speakers had addressed the meeting a discussion followed, at the conclusion of which the following resolution was unanimously adopted: "That a committee consisting of seven be appointed to consider the advisability of promoting an electrical club, and to present a report at a subsequent meeting." Messrs. J. Irnis (consulting electrical engineer), W. H. Whitehouse, and W. Smith (Municipal Technical School), E. R. Wood (electrical engineer), H. W. Dipple (National Telephone Company), M. G. Waggot (Post Office), and W. Dalby (Midland Railway), were appointed a committee to give effect to the resolution.

The McMillan Memorial Fund.

The McMillan Memorial Fund at the present time amounts to about £1,710. In order that the £2,000 asked for by the Council may be quickly completed, we would suggest that intending contributors to the fund should communicate without delay with Mr. G. C. Lloyd, the present secretary of the Institution of Electrical Engineers.

Shoreditch Electrical Exhibition.

The Shoreditch Electrical Exhibition, which closes on Saturday, at the Pitfield Street Baths, has been organised by the Lighting Committee of the Shoreditch Borough Council, with the object of bringing to the notice of the public the advantages of electricity for lighting and power purposes. Among the exhibitors are Messrs. Babcock and Wilcox, Ltd., the Crypto Electrical Company, J. Defries and Sons, Crampton and Co., the Simplex Steel Conduit Company, Ltd., Matthews and Yates, W. T. Glover and Co., the General Electric Company, the Electric Construction Company, the Electromotor and Dynamo Company, the Brochie Pell Arc Lamp, Ltd., etc.,

New Graving Dock for the Tyne.

The new graving dock opened on Tuesday, at the Shipbuilding yard of Messrs. Robert Stephenson and Co., Hebburn-on-Tyne, is the largest existing on the East Coast. The new dock will be of great advantage to the trade of the Tyne; moreover, it will take in a battleship of the largest size with all her guns on board, and is therefore of national, no less than local, importance. The dock is 700 ft. long on the floor from the inside of the caisson, 90 ft. wide at the bottom, and 111 ft. wide at the coping, and has been constructed by Messrs. McAlpine and Co., of Glasgow, to the designs of Messrs. Thomas Meik and Sons, of London and Glasgow.

To Explore the Pacific.

The steamer *Veronique*, late the *Harlech Castle*, belonging to the Union-Castle Mail Steamship Company, Limited, of 3,264 tons, has been purchased by Lord Fizwilliam, who is leaving Southampton on Wednesday on an exploring expedition in the Pacific *via* the Straits of Magellan. The steamer is under the command of Captain E. Morrison, with a crew of 58 hands. The object of the expedition appears to be to determine the existence of coal in the Solomon Islands.

SIR WILLIAM HUGGINS, K.C.B., O.M., F.R.S., D.C.L., LL.D., PH.D., D.Sc.,

President of the Royal Society.

SIR WILLIAM HUGGINS, whose career has been mainly devoted to the investigation and development of spectroscopic astronomy, is a native of London. Born in 1824, he pursued his preliminary education at the City of London School, and subsequently under private tutors studied mathematics, chemistry, and electricity. In 1856 he built and equipped a private observatory at Tulse Hill; here, untrammelled by academic duties, Sir William was able to follow his scientific propensities free from restrictions. For over fifty years his scientific labours have been concentrated on the application of spectrum analysis to the heavenly bodies. From his many remarkable discoveries has been developed the science of Astrophysics.

Honours and distinctions in recognition of his invaluable scientific researches have been liberally conferred upon Sir William. He has received a Royal Medal, the Rumford Medal, and the Copley Medal from the Royal Society, two medals from the Royal Astronomical Society, and many foreign decorations. He became President of the Royal Astronomical Society in 1876; President of the British Association, 1891; President of the Royal Society, 1900.

The Shipbuilding Outlook.

At the luncheon which followed the launch of the *Patrol*, at Birkenhead, on Wednesday last, Mr. J. M. Laird drew a black picture of the prospects of the shipbuilding industry. Yet, while the outlook for the immediate future was gloomy, Mr. Laird pointed out that when Tranmere Bay development was completed his company would possess the finest shipyard in the world. Meanwhile, prices had been cut so low that orders had been refused.

Personal.

Mr. William Frecheville, A.R.S.M., has been unanimously elected president of the Institution of Mining and Metallurgy, in succession to Mr. Hennen Jennings.

Sir Oliver Lodge, at the opening of the winter session of the Midland Institute, Birmingham, lectured on "Mind and Matter," the address being part of a criticism of Haeckel's conception of the universe.

Lighting by Petrol.

A demonstration was given in London a day or two since of a new lamp designed to burn petrol in conjunction with an incandescent mantle. The lamp is being introduced by the Clarafax Lamp Company, of Burton-on-Trent; and where neither coal gas nor electricity is available, such a lamp may, no doubt, find its uses.

The petrol is contained in a metal receptacle placed above the lamp, as far away from the burner as possible, and flows by gravitation to a chamber below the mantle, the supply being regulated by a stop-cock. There it is vaporised, a portion of the vapour being burnt in a small jet to provide the heat necessary for vaporisation, while the remainder, mixed with air, ascends to the burner proper. For starting the lamp there is under the vaporising chamber a little cup containing some asbestos, and a small quantity of methylated spirit placed in this, and ignited with a match affords the necessary initial heat to warm the chamber to the temperature at which the petrol becomes vaporised. After this has been done the lamp is automatic in its action. If desired a number of lamps, instead of being self-contained, can be supplied from one common reservoir, flexible metal tubing $\frac{1}{16}$ in. to $\frac{1}{8}$ in. external diameter conveying a sufficient supply of petrol for several.

On the question of cost, it is claimed that one quart of petrol at 3½d. will maintain one 150-candle power burner in action for about sixteen hours.

THE COTTON AND SILK COVERING SHOP IN THE WORKS OF THE ST. HELEN'S CABLE CO., LTD.

(See page 444.)

THE MINING INSTITUTES AND AMALGAMATION.

INTERVIEW WITH Mr. McDERMID.

A REPRESENTATIVE of Page's Weekly has elicited, in the course of an interview on Tuesday, from the secretary of the Institution of Mining and Metallurgy some interesting personal views on this old and vexed question. "Have you," asked our representative, "had an opportunity of reading the speech made by Professor Redmayne on Monday, in delivering the presidential address at the Staffordshire Institute?"

Mr. McDermid confessed he had not.

"I refer particularly," said our representative, "to that part of the speech dealing with the question of amalgamation. Professor Redmayne spoke as follows: 'Could not some *modus vivendi* be arrived at as between the Institution of Mining Engineers and the Institution of Mining and Metallurgy in London, either in the way of amalgamation or of definition of spheres of operation. The latter Society is doing extremely good work; its meetings are well attended; the papers, especially of late, are of an increasingly high standard, and the discussions animated and productive of good. It seems a waste of energy for these two Societies to be working on more or less the same lines and yet to remain distinct.'"

Mr. McDermid, of course, recognised in this quite an old friend.

"Professor Redmayne added that if the title of M.I.M.E. is to be regarded throughout the mining world as a designation of real importance, the standard of admission must be raised."

Mr. McDermid sympathised with that observation.

"But," he added, "although my Institution is actuated by the friendliest sentiments towards the Institution of Mining Engineers, it is clear that amalgamation at the present time is impossible, owing to the very different rules governing membership of the two bodies. As a matter of fact, the whole subject was discussed as recently as 1902 at a joint conference, and the decision arrived at by my Institution was that under existing conditions federation in any form was impossible. Something, however, might perhaps be done in the way of broadly defining the respective spheres of operation even under existing conditions."

Beyond that Mr. McDermid would not go. He pointed out the fundamental differences in the rules governing admission to the two societies.

"The rules," Mr. McDermid pointed out, "explain why the Institution of Mining and Metallurgy regards federation as impossible. The net of the Institution of Mining Engineers is too wide. The qualification test of the Institution of Mining and Metallurgy is much more severe, and in many ways the Institution is constantly endeavouring to define and raise the standard of professional qualification and status of the mining engineer. There is the further distinction between the two Institutions that whereas the Institution of Mining Engineers is situated right in the centre of the coal and iron mining districts of this country, and its members are mainly concerned with those industries, the members of the Institution of Mining and Metallurgy are mainly interested in metalliferous mining in every part of the world."

Here the position rests for the moment, but it is hoped that something may come of the suggestion thrown out by Professor Redmayne, and tentatively accepted by Mr. McDermid, that the sphere of operation be broadly defined.

QUESTIONS OF THE DAY.

I.—The London Telephone Service: How Can it be Improved?

(Continued from last week.)

I AM glad to say that the letters published last week from satisfied users of the telephone did not exhaust the list of those received.

The questions addressed to a number of representative readers were as follows :—

(1) Are you satisfied with the telephone services in London?

(2) In what direction is improvement desirable?

(3) How do you consider such improvements can best be brought about?

The following are further letters from users of the telephone who are satisfied :—

We beg to state that we are satisfied with the telephone service in London. We consider an improvement desirable in cases where the number which we ring up is engaged, as it often happens that this same number cannot be got for a considerable time, although in between our different calls this number may be free for some time. In this case we suggest that either automatically, or by another way, the first caller should be connected with the desired number, and informed by the exchange of the connection.—S. Wolf and Co.

(1) On the whole, *yes*. (2) On the point of *distinctness*, sometimes the messages are *quite* clear, and at others quite the reverse, particularly in the case of French lines. The service has been much better since the "combine" of National and the General Post Office.—Priestman Brothers, Ltd.

We have not very much to say in the matter. The service appears to have been fairly satisfactory; but since the signalling bells have been dispensed with on our system the actual working of the instrument does not seem to have been quite so good.—Everett, Edgcumbe, and Co.

We do not consider we are in a position to pass an opinion on the subject, having only been on the telephone such a very little while. We might add that during the time we have been on, we have had no cause to complain.—C. Kite and Co.

Sir Walter Peace is of opinion that the telephone, service could be improved; but, as he stops short there, I conclude that he is, generally speaking satisfied.

THE QUESTION OF CONTROL—RENT.

Having disposed of these I may turn to that portion of the correspondence in which attention is paid to the questions of rental and control. We have seen that, in the opinion of a competent expert, Mr. Herbert Laws Webb, M.I.E.E., two very simple measures are required for the best future of British telephony. (1) The legal abolition of the Government licence, and, with it, the abolition of the royalty. (2) An Act which should make it illegal, after a certain date, to charge a flat rate for telephone service in any place of more than, say, 50,000 inhabitants.

Correspondence concerning this aspect of the question has been received as follows :—

There is room for considerable improvement in the telephone service in London, but it is *not* to be brought about by handing over the whole of the lines to the Post Office. Anyone who has had any experience of the trunk service of the G.P.O. can only view with apprehension any suggestion to give them the entire control of the London service. The improvement would seem to lie in the direction of giving the National Telephone Company facilities for improving their service, which are at present denied to them.—From an Engineering Firm in Victoria Street, S.W.

(1) Not satisfied. (2) In direction of certainty of being able to communicate with clients without serious delay—and cheaper rent of apparatus. (3) This is a matter for telephone experts. Probably more alternative lines would very materially help.—Professor William W. F. Pullen.

We beg to reply to your questions as follows: (1) We are very far from satisfied with the services at present afforded by the National Company and the

Post Office. (2) The provision of increased and improved plant and connecting wires between the exchanges, so as to reduce the incessant and irritating interruptions, both accidental and on the part of the operators, to a minimum. (3) In the first place, by more rational treatment by local authorities in the matter of way-leaves and permission to lay underground wires; and, secondly, by the removal of the unfair restrictions exercised by the Post Office, or, as an alternative, the taking over of the Company's service, and the formation of a Government monopoly, worked as a distinct department in conjunction with, but not subject to, the present Post Office staff.

We might remark that in Liverpool, where the National Company has been treated rationally in respect to way-leaves and under-ground wires, while at the same time duly safeguarding the interests of the ratepayers, the service afforded is very decidedly superior to that in London, and is, consequently, more universally used, both publicly and privately.—J. and E. Hall, Ltd. (Dartford Ironworks).

CIVILITY AT THE TELEPHONE.

I have voiced the complaints of some who say that they do not receive ordinary civility at the hands of the operators, though I am glad to believe that this is exceptional rather than the rule. There is another side of telephone etiquette, however, which, I imagine, is necessary to the working of any efficient telephone service. I refer to the necessity for civility and courtesy on the part of all users of the 'phone. Reference was made last week to the very prevalent practice of entrusting the office-boy with the preliminary negotiations at the telephone.

I may here also quote Mr. Herbert Laws Webb, M.I.E.E., who is very emphatic upon this point in his new work on "The Telephone Service":—

The first principle of telephone etiquette demands that the calling subscriber shall be at the telephone when the called subscriber answers. Many telephone users habitually violate this principle, and call by proxy—the proxy generally being an office boy. This practice is a slight to the called subscriber, and it causes much waste of valuable time on the wires. To many of us it is a daily experience, and none the less exasperating for being daily, to be called up by an office boy and to be told, "Wait a minute, Mr. So-and-So wants to speak to you." Often one has to wait more than a minute before Mr. So-and-So's voice is heard. This proceeding is rude—if So-and-So wants to talk to me he should be on the line as soon as I am—and it is shockingly time-wasting. If there is an office boy at each end of the line, the waste of time becomes prodigious. The waste of time involved in these proceedings applies not only to the people concerned, but to the valuable telephone plant, and it all helps to block traffic. Another point in telephone etiquette is the manner of addressing a person on the telephone. Many people are extremely blunt and aggressive on the telephone, when they would never dream of being so if addressing a fellow-being face to face. A common form of telephonic rudeness is "Who are you?" If my telephone bell rings, I resent being asked, when I answer it, who I am. Who should I be? The natural form of address, I being invisible, is "Is that Mr. So-and-So?" I naturally answer "Yes," and all goes smoothly.

Other letters bearing upon the alleged lack of attention on the part of the operators are as follow:—

Replying to your circular letter *re* London telephone service, we would say as follows: (1) The London telephone service being the best in London, we have to be satisfied. (2) Better attention at the exchange. Better inter-exchange arrangements. Better supervision of both mechanical and electrical apparatus. (3) Not being well acquainted with the system on which the London telephone service is worked, it is impossible to answer this question satisfactorily; but we would suggest that if the operators attended to their business as they should, a great deal of trouble would be done away with.—Fairbanks, Morse, and Co.

———

(1) Emphatically no. (2) and (3) With the present systems the personal factor is a most important one, The services would be much improved if only good-tempered, patient clerks, who can articulate distinctly, were employed under efficient control.—Professor Henry J. Spooner, C.E.

———

(1) *No* (speaking of the National Company's service). (2) Prompter attention to calls; frequently we are unable to get reply from exchange at all. Less interruption on part of exchange when subscribers are talking. More care on part of operators to connect with number asked for, and not to give any number they may choose. (3) Better system of communication with exchange. More attendants with less

number of subscribers to look after. Same facilities should be accorded to the Company as enjoyed by Post Office authorities in connection with laying lines. —A large firm of Machine Tool Makers.

CUT OFF.

(1) No. (2) A great improvement would be to be able to get more prompt attention from the exchange, and to get on with the number you require in less time than it takes at present. Further, when you are in communication and talking to your correspondent, that you are not cut off in the middle of the conversation. (3) We think this is a question entirely for the Telephone Company themselves to answer, as we are not familiar with the internal working of their system.—C. W. Burton, Griffiths, and Co.

———

We do not consider the London telephone service is efficient, chiefly owing to two reasons: (1) Delay in obtaining an answer, and in making a connection. (2) Liability of being cut off in the middle of a conversation. We do not know how such objections can be removed, as the question is a very highly technical one.—Jeremiah Head and Son.

WANTED—GREATER DISTINCTNESS.

(1) Partially, not entirely. (2) Better connections at exchanges. Conversation at times inaudible. (3) *a*. Greater attention to details. *b*. More frequent inspections. *c*. Keeping up better insulation of lines, switches, and connections.—Geo. Hy. Hughes, M.I.M.E.

———

Our chief complaint as to the service of the National Telephone Company is indistinctness, due presumably to defective instruments or connections. As to the attendance at the exchanges, it at times is very unsatisfactory and irritating, but we think, on the whole, fairly good.—The Thames Iron Works Shipbuilding and Engineering Company, Ltd.

———

(1) No. (2) In every direction. (3) We are unable to say, as it is altogether too tall a matter for us.—The West Hydraulic Engineering Company.

———

(1) We are by no means satisfied with the telephone service in London. (2) The instruments should be absolutely reliable, but at present it is quite uncertain whether the exchange can be called up or not. We may also state that quicker replies to calls from the exchange would be of great benefit. Operators should be instructed not to break in upon conversations between subscribers, nor disconnect them before both have rung off. (3) It is for experts in telephonic communication to say how improvements of this kind can best be brought about—we are not sufficiently technical.—The United Kingdom Lighting Trust, Ltd.

———

(1) No. (2) Bad service. Hearing and transmission more often than not faulty.—The Sun Electrical Company, Ltd.

———

(1) Emphatically no. (2) Greater distinctness and quicker connections. (3) More up-to date receivers and transmitters, and greater number of service lines —The British Aluminium Company, Ltd.

THE HUMOROUS SIDE.

Not everyone can afford to look at telephone difficulties in a humorous light. One correspondent, however, says:—

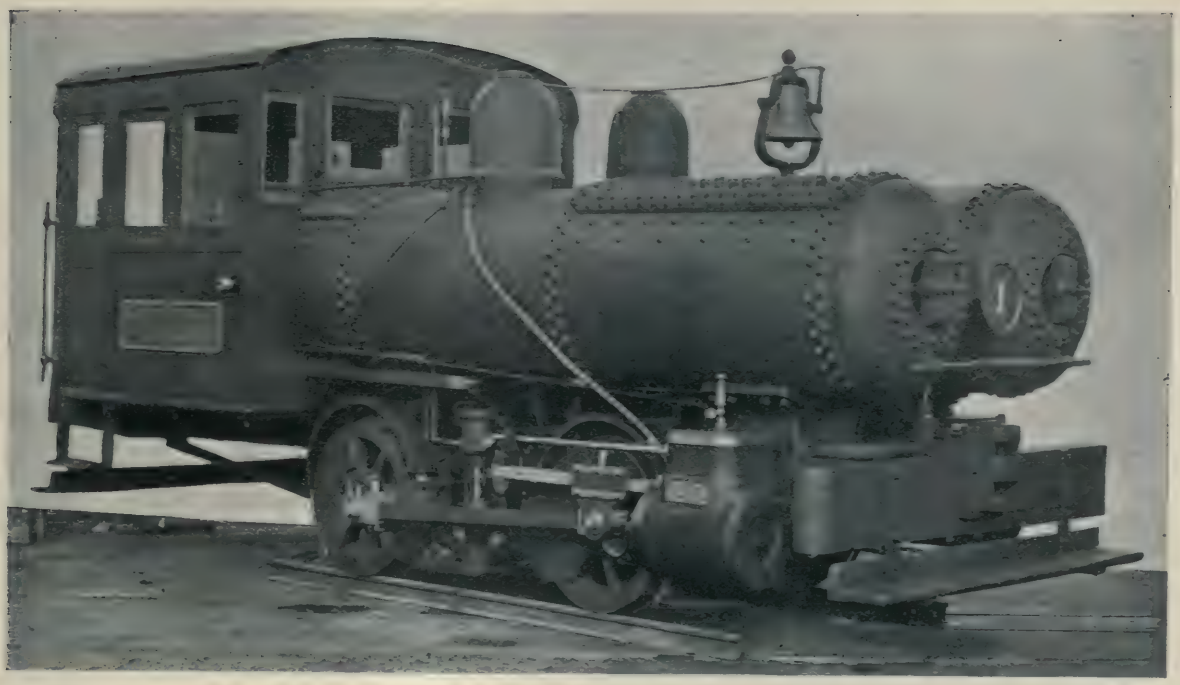
There are days and times when I believe that the service we get on the Post Office 'phone is as good as it could be desired, the girls at the other end are prompt to reply, courteous, and seem to be on the look-out for signals; on the other hand, on other occasions it is a wild game to play at, to try to use the above-named instrument. You vibrate the trigger, or whatever you call it, on the 'phone, fondly hoping that at the other end of the line somebody will, in revenge for the flashes of light you are trying to create, shout back and ask what you want, but either they use smoked glasses at the exchange, and are, therefore, free from the danger of hurting their eyesight, or else they are the most phlegmatic lot of girls that ever yet went into a telephone office. Can't have any nerves, I think.

I think it must be largely a matter of the *personnel* at the exchange, because I have noticed that when finally I should get a call, after a bad quarter of an hour, and I sharply ask for the inquiry office, they sweetly ask me if I would not like to have the number I originally wanted—and what are you to do?—Ronald Trist (of the Quaker City Rubber Company).

CONTINENTAL SERVICES.

In reply to your inquiry: (1) The Continental services with which I am acquainted are quicker and better. (2) Delay occurs here mostly when speaking with a different exchange and especially so when speaking from a P.O. telephone to a National telephone. (3) By automatic exchanges now said to be working successfully in America, enabling subscribers to couple up direct to each other.—H. J. A. Hermann (Humboldt Engineering Works Company).

(*To be continued.*)



PORTER COMPRESSED AIR LOCOMOTIVE OF THE ORDNANCE DEPARTMENT OF THE UNITED STATES NAVY.
Built by Messrs. H. K. Porter Company, Pittsburg, Pennsylvania.

LOCOMOTIVE ENGINEERING NOTES.

By CHARLES ROUS-MARTEN.

New Great Eastern Tank Engines.

A FEW days ago I travelled with one of the new tank engines built by Mr. J. Holden for the suburban work of the Great Eastern Railway. It will be remembered that when the famous Decapod was built to provide for the ultimate extremity of traction needs on the Great Eastern's heavy suburban traffic, a resolution was come to that as the use of the Decapod would involve the strengthening of certain bridges and of various parts of the permanent-way, neither having been constructed of sufficient strength to carry such locomotive mammoths, a further attempt should be made to manage with engines of the existing type, slightly modified, until this serious outlay should have become absolutely imperative.

The new tank engines, which are ten in number, viz., Nos. 80–89, and which were built at the Stratford works, are the outcome of this decision. They run on six wheels, 4 ft. in diameter, all coupled. The cylinders have a diameter of 16 in., and the length of the piston stroke is 24 in. The engines have therefore a nominal tractive force of 128 lb. for every lb. of effective steam pressure on the pistons. So far, it will be observed that the new engines are practically identical with the standard type which has been in successful use for many years. Those have always proved most useful machines, very cheap to build, efficient in their work, and economical in repairs. The new ten differ in having a material increase in boiler-power, obtained through a considerable enlargement of the firebox, and by increase of the steam pressure to 180 lb. per square inch. As thus modified, these sturdy little engines should prove fully equal to the duty required of them, which is to haul seventeen of the enlarged six-wheel coaches, and to attain a speed of 30 miles an hour in one minute from the dead start with that load in normal circumstances and conditions.

When the new "80" type shall have become outclassed by the increase of traffic, then the rebuilding of bridges, strengthening of permanent way, and employment of

he Decapods will no longer be capable of postponement. Meanwhile, as the standard six-coupled tanks come in for rebuilding, they will be given, I understand, the larger firebox and enhanced steam pressure of the new "80" class.

Six-Coupled Tank Engines.

It has long been a matter of surprise to many engineers beside myself that the use of six-coupled tank locomotives on the very heavy suburban work of our British railways should have been so long delayed, and that even now it is so much limited in its extent. Twenty years ago, so far as I can recollect, the only British main-lines that employed six-coupled tank engines on passenger trains were the London, Brighton and South Coast and the Lancashire and Yorkshire. The L. and Y. engines had a trailing pair of carrying wheels. The London, Brighton and South Coast tanks were, of course, the well-known "Terriers" of the late Mr. William Stroudley, many of which are still at work. They may be said to have been the prototypes of the Great Eastern "80's," but were much smaller, having cylinders only 13 in. by 20 in., instead of 16 in. by 24 in, and proportionately less boiler power. These little "Terriers" have done an amazing amount of good and smart duty. They, with their tiny 3 ft. 10 in. wheels, have worked in turn with other tank engines having four-coupled 5 ft. 6 in. wheels, and have always proved thoroughly efficient. I do not say that they could run expresses from London to Brighton or *vice versa*. They have numerous disqualifications from employment on that sort of service. But for suburban work they, like Mr. Holden's 4-ft. wheel six-coupled tanks, have always seemed to me singularly well adapted as regards efficiency, beside possessing the advantage, which cannot be wholly ignored, of cheapness as to prime cost. Still, for a number of years after their introduction they remained the only six-coupled tanks ever seen in London on passenger trains. Then came the Great Eastern engines, and up till a comparatively recent period those two railways were the only ones which used such engines for that sort of work.

A Revolution in Practice.

This was all the more strange, seeing that the particular essentials for that class of service are haulage power and quickness in starting. Sustained high speed is not called for. It is true that ordinary tank engines are often used to run semi-express trains, and the Board of Trade has more than once (or twice) had something disagreeable) to say about that practice. I have never deemed those official utterances entirely warrantable, because they were too sweeping, and lacked discrimination between the various circumstances and conditions involved. But, assuredly, normal suburban duty could be better performed by six-coupled tanks with 4 ft. to 5 ft. wheels, than could even semi-express work by four-coupled tanks with 5 ft. 6 in. wheels—the normal size used in such locomotives. When the Fowler tanks came out on the Metropolitan and District Railways many years ago, with their four-coupled 5 ft. 9 in. wheels, it was pointed out by more than one engineering authority that these wheels were needlessly large, and by their size sacrificed a good deal of useful tractive force, while six-coupled wheels of smaller size would have made the engines largely more serviceable. Yet not only have those engines worked for years on the Metropolitan and District Railways, but also a number were built for the same services for other lines that run on the Metropolitan and District metals, including the London and South-Western, London and North-Western, and Midland lines. All of these latter ones have long been taken off that work, and most have been rebuilt for branch line duty. Those of the London and North-Western—some of which used to be kept at Euston to run out after heavy expresses, catch them up at the foot of the Camden bank of 1 in 70, push them up, and then drop off—are now, as ten-wheeled tanks, doing much useful service in the Manchester district, where I saw several of them a few days ago. But the London and North-Western, for a quarter of a century or so, has worked its "Underground" trains with double-ended tanks, having 4-ft. 6-in. wheels, four-coupled and radial wheels at each end, while the London and South-Western and Midland employ their ordinary standard tank engines with trailing bogies, and 5-ft. 3-in. to 5-ft. 6-in. four-coupled wheels. It may be added that the London and South-Western, Great Northern, Midland, and North Eastern still stick to the four-coupled wheels, usually 5 ft. 6 in. in diameter, for suburban service. Upon most, if not all, of the other English main lines, however, a marked revolution as regards this practice has decisively set in.

Extending Use of Six-Coupled Surburban Tank Engines.

Upon the London, Brighton and South Coast, which was the parent line of this departure, the progress is the most noteworthy of all. While the little "Terriers" were in their heyday, another class of six-coupled tanks—such as "Toulon"—was often used in turn on the heavier suburban passenger trains. These engines, which were also designed by Mr. Stroudley, were, strictly speaking, for goods service, especially for shunting in the large yards

such as Battersea. They had—indeed have, for I believe all are still running—4-ft. 6-in. coupled wheels, and 17-in. by 24-in. cylinders. About a dozen years ago a somewhat larger "breed" came out, which were given radial trailing-axles. These were designed by Mr. R. J. Billinton. Next followed a much bigger type, designed on the same general lines, but with 5-ft. wheels and greater boiler power. They, too, were built from Mr. Billinton's design, and are undoubtedly very excellent machines. There, it seemed to me, the development might fairly have stopped, as these latest engines were able to do, and do satisfactorily, everything that the London, Brighton and South Coast's requirements called for. However, Mr. Billinton thought otherwise, and he should know best. He then brought out his latest type with six-coupled 5-ft. 6-in. wheels, and increased boiler and cylinder power. Thus there are at present on that one railway no fewer than five different classes of six-coupled tank-engines, all working in turn on passenger-train duty.

"The Entry of the Giants."

This heading has nothing to do with the Wagner opera "Das Rheingold," in which it also occurs. In the present case, the reference is to the two gigantic classes of six-coupled tanks, which have come out lately on the Great Western and Lancashire and Yorkshire respectively. Both have already been described in my notes, and I need not repeat what I said before as to their dimensions, etc. I understand that a somewhat smaller variant of the former is now in contemplation and will shortly appear. The latter has been multiplied, and I saw several a few days ago at work in Manchester and its neighbourhood. They are veritable colossi, and certainly ought to pull anything, as I daresay they do. The peculiar character of most of the Lancashire and Yorkshire main lines—plural *bien entendu*—is such as to lend itself specially to being worked by large tank-engines, the runs without stop being short, the gradients steep, the loads heavy, and the speeds, as a rule, moderate.

NEW AMERICAN 8-COUPLED FREIGHT LOCOMOTIVE, BUILT BY THE BALDWIN LOCOMOTIVE WORKS.

Class $10\frac{40}{64}$ E 10. Road No. 61. Built for Norfolk and Western Railway.

Gauge	4 ft. 8½ in.
Cylinder	23 in. & 35 in. x 32 in.
Valve	balanced.
Boiler.	
Type	wagon top.
Material	steel.
Diameter	68 in.
Thickness of Sheets	11/16 in. & ¾ in.
Working Pressure	200 l s.
Fuel	soft coal.
Staying	radial.
Fire Box.	
Material	steel.
Length	121 in.
Width	41¾ in.
Depth front	74 in.
,, back	72 in.
Thickness of sheets, sides	⅜ in.
,, ,, ,, back	½ in.
,, ,, ,, crown	5/8 in.
,, ,, ,, tube	½ in.
Water Space.	
Front	4 in.
Sides	3½ in.
Back	4 in.

Tubes.	
Material	iron.
Wire gauge	0·110 in.
Number	306.
Diameter	2¼ in.
Length	14 ft. 6 in.
Heating Surface.	
Fire Box	195 sq. ft.
Combus. Chamber,	
Tubes	2,593 sq. ft.
Firebrick tubes,	
Total	2,788 sq. ft.
Grate area	34·8 sq. ft.
Driving Wheels.	
Diam. of outside	56 in.
,, ,, inside	50 in.
Journals, main	8½ in. x 10½ in.
,, others	8½ in. x 10½ in.
Engine Truck Wheels.	
Front, Diam.	30 in.
Journals	6 in. x 10 in.
Back, Diam.	
Journals,	

Trailing Wheels.	
Diameter,	
Journals,	
Wheel Base.	
Driving	15 ft. 6 in.
Rigid	15 ft. 6 in.
Total Engine	24 ft. 6 in.
,, Engine & Tender	52 ft. 5 in.
Weight	
On Driv. Wheels	166,000 lbs.
,, Truck, front	20,000 lbs.
,, ,, back	[illegible]
,, Trailing Wheels	[illegible]
Total Engine	186,000 lbs.
,, ,, & Tender	
about	300,000 lbs.
Tender.	
Wheels, No.	8.
,, Diameter,	33 in.
Journals	5½ x 9 in.
Tank Capacity	6,000 gals.
Service	Freight.

AUTOMOBILE NOTES.

(BY OUR AUTOMOBILE CORRESPONDENT.)

More Lamps Wanted.

I tender my respectful sympathy [to H.R.H. the Duke of Connaught, who seems to have had a very nasty spill. Very often, we know, motorists are regarded as the autocrats of the road, but it cannot be denied that they are now very severely hampered with restrictions. Consequently it is only fair that reasonable regulations should also apply to ordinary vehicular traffic in the matter of efficient lighting.

Motorists are asking—and, I think, very reasonably—that all vehicles shall carry lamps after dark, so as to show a white light in the direction in which they are proceeding, and a red light in the contrary direction—a provision similar to that which has already been enacted for motor-cars.

International Cup for Motor Boats.

Some little discontent was expressed by competitors in the last race for the British International Cup for motor-boats, with the rules governing the contest. As a consequence these have been altered in several particulars, and in their amended form can now be obtained from Mr. Basil H. Joy, the technical secretary of the Automobile Club. The most important alteration is that in future the race will be made from a flying start, an arrangement which should render impossible the recurrence of such an awkward incident as that which robbed *Napier Minor* of her victory at Ryde this year. Another change which is likely to have excellent results is the amendment of rule 4, which lengthens the course from 12 knots to between 30 and 35 knots. This should tend to the evolution of a better and more trustworthy type of boat. A further alteration in the same rule, which provides that there shall be no sharp turns on the course, seems of more doubtful value, though it will certainly ensure a better race as such. Under certain circumstances it might open the door to a type of racing boat more cranky and less reliable than is desirable. Minor alterations have been made in one or two others of the rules, and on the whole the new conditions for the race are an improvement on the old, and should permit of a contest more satisfactory to all concerned in marine motoring.

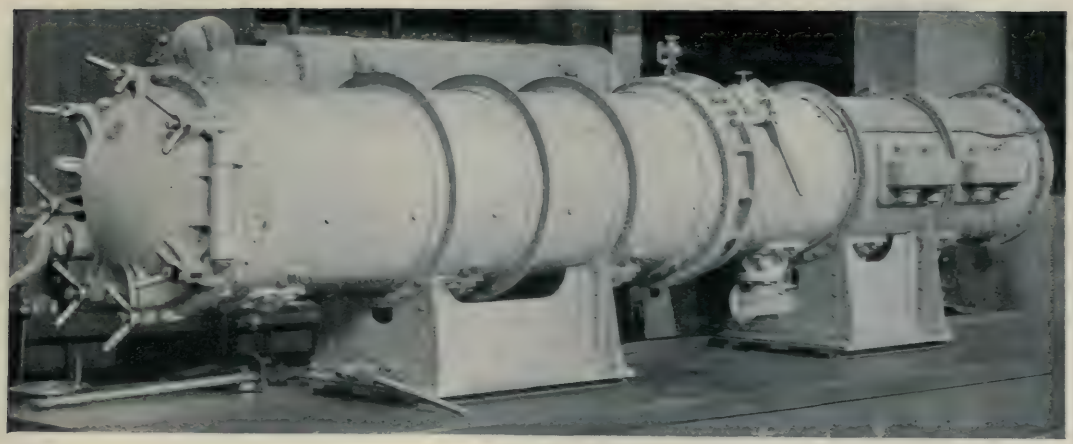
British and Foreign Motor Cars.

Mr. S. F. Edge, in a letter which appeared a few days' since in the daily press, made some very interesting explanatory comments on the recent Board of Trade returns of the imports and exports of motor-cars and parts. He says: "It is true that British exports in completed cars appear to show a falling off in the first eight months of 1904, as compared with the first eight months of the previous best year. But when one looks into the matter it is found that this falling off is only to the extent of £10,000 in completed vehicles whereas in parts of motor-cars there is an increase of no less than £18,588. This means simply that, to avoid part of the duty in protected countries, wideawake British manufacturers have found that they can introduce their motor-vehicles more cheaply in pieces, under the heading of "general machinery," than under the heading of "complete motor carriages." As regards imports there has been an increase of no less than £375,780 in the value of imported motor-cars and parts. This, again, when fully understood, is much better than it appears at first sight. In the first place the increase of motor users in Great Britain has been far in excess of the 25 per cent. increase that is shown by the imports, so that Great Britain has really begun, from a manufacturing output point of view, to catch up its home trade. Again, all the touring cars which go abroad to the South of France in the Spring, to the Gordon Bennett race in the middle of the year, and to the Continent from England during all months of the year, are recorded by officials when returned to Great Britain as imports to this country."

It is certainly interesting to find that a gentleman whose position in the motor industry gives him ample opportunity of judging, asserting that the motor manufacture in this country is not quite in the unfavourable position so many critics assure us it is. It has taken the British manufacturer a long time to approach a position in which he can fully cope with the home trade in motor-cars, but signs are increasingly visible that he is now doing so.

Automobilism in India.

Automobilism is making rapid strides in India, and at Christmas the first reliability trials, held under the jurisdiction of the Motor Union of Western India, will take place. The trials will be run from Delhi to Bombay, a distance of about 880 miles, over stiff roads. The Gaikwar of Baroda has offered a handsome cup for the car which goes through the trials with the least number of involuntary stops.



SUBMERGED TORPEDO TUBE.

NAVAL NOTES.

WEEKLY NOTES ON NAVAL PROGRESS IN CONSTRUCTION AND ARMAMENT.

(BY OUR NAVAL CORRESPONDENT.)

GREAT BRITAIN.

IN addition to the notes on the progress of the British battleships under construction last week, it must be mentioned that the *Dominion*, which is building at Barrow, has been out for her maiden trip. Laid down on May 23rd, 1902, she has now been twenty-nine months building, so that progress on her has been very rapid. Although it has not yet been officially announced, it is understood that the *Britannia* will be launched on December 10th.

There has been an attempt, which fortunately did not succeed, to decry the *Triumph* and the *Swiftsure* because they broke down so soon after entering on active service. But in neither case is the trouble serious. Slight defects in the engine-room, which may or may not have been caused by injudicious management, do not take a deal of repairing, and by all accounts both vessels have proved themselves excellent sea-boats, and, whenever necessary, have had no difficulty in attaining the speeds they made on trial. These two vessels are valuable adjuncts to the Home Fleet.

And *à propos* of engine-room defects, an admirable report comes from the *Formidable*, which has just returned home from the Mediterranean, and has re-commissioned for service on that station. Her boilers are of the Belleville type, and have given no trouble of any sort during the commission. Moreover, they have proved very economical. How they will stand the strain of a further three years' hard work remains to be seen, but it is becoming daily more certain that the Belleville, in trained hands, is one of the best steam generators at present invented.

As stated last week, Eng.-Com. H. W. Metcalfe's system of coaling at sea is receiving a very thorough trial. The appliances are fitted to the sloop *Basilisk*, and a further series of experiments are shortly to be carried out, possibly in the neighbourhood of Spithead. One of the battleships of the Home Fleet is to be detailed for service in this connection, and the difficulty with the endless whip, which prevented the previous experiments being completely successful, is now believed to have been overcome.

Two more scouts have been launched, the *Petrol*, by Cammell, Laird and Co., on October 12th, and the *Foresight*, by the Fairfield Company, on the 8th. Both these vessels belong to the second batch of scouts, and only two more, the *Attentive* and the *Skirmisher*, remain on the stocks at Elswick and Barrow respectively.

GERMANY.

The growth of the German navy has been the subject of comment in these notes on several occasions; but it has not previously been remarked to any great extent that with the increase of the material the *personnel* has not been allowed to lag behind. In the five years between 1899 and 1904 the additions to the *personnel*

THE RUSSIAN BATTLESHIP "PERESVIET."

Displacement, 12,674 tons ; I.H P., 14,500 ; speed, 18·5 knots ; heaviest armour, 9·5 in. ; heaviest gun, 10 in.

It was stated on Monday that the Russian battleship *Peresviet* in Port Arthur harbour caught fire from the Japanese plunging shells, and burnt for fifteen minutes. The *Retvizan* attempted to escape, but failed to do so, and is now moored across the harbour mouth.

of the fleet have been remarkable. In 1899 there were 24,580 of all ranks; to-day there are 35,352. The increases are most notable in the commissioned and petty officers' numbers, although there has been a marked increase all round. The numbers in the various branches at the present time are: ships' officers 1,250, engineer officers 223, surgeons 197, paymasters 164, warrant officers 1,587, petty officers 7,111, and seamen 24,820. By 1917, at which date the naval programme of 1900 should be completed, it is anticipated that there will be 60,000 men serving in the navy.

ITALY.

The most important event of the week in Italy has been the launch of the *Vittorio Emanuele*, at Castellamare, at which function the King of Italy presided. The *Vittorio Emanuele* is the second of a group of four vessels of 12,625 tons and 22 knots. She was laid down in September, 1901, and has been therefore, just over three years on the stocks. The *Regina Elena*, which was begun at the same time, at Spezia, has already been in the water over a year. The other two vessels of this class, the *Roma* and *Napoli* are building at Castellamare and Spezia respectively, but have only been in hand about a year. There are also three vessels building by the Terni Trust, which were reported last year to be building for the Italian Government, and were to receive the names of *Duca d'Aosta*, *Duca di Genova*, and *Duca degli Abruzzi*. These vessels, it has since been announced, are not for Italy, but will be sold when completed, to the highest bidder.

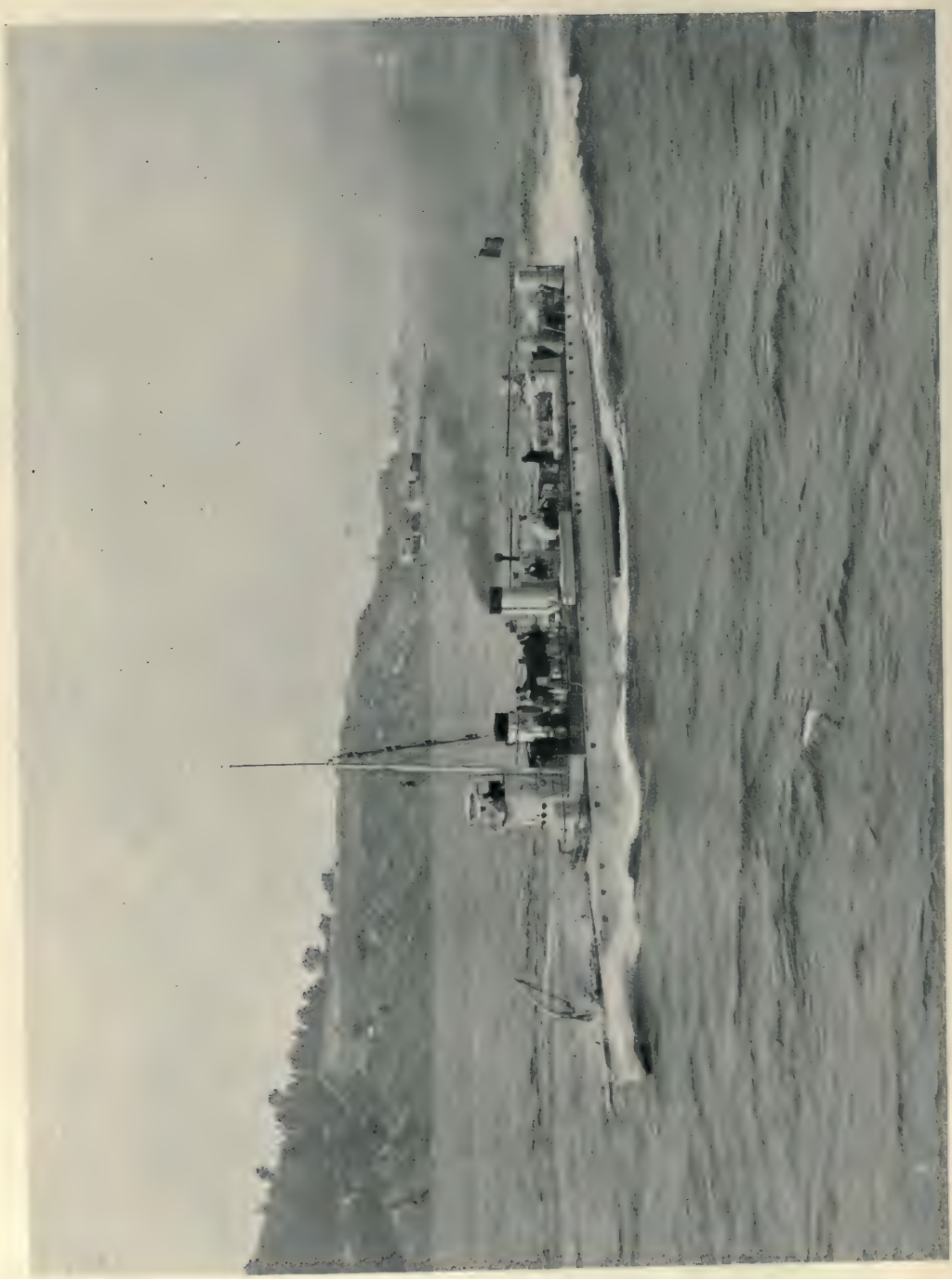
The *Regina Margherita*, of an earlier class, and which was launched in 1901, has just entered upon her final trials. She is heavier than the *Elena*, but has two knots less speed. Her boilers are of the Niclausse type, twenty-eight in number, supplying steam to two sets of engines. Her first trial took place in July last, when, with natural draught, she developed 17,782 h.p., with a coal consumption of 1·84 lb. per h.p. per hour, and attained a speed of 19·3 knots. At a one-and-a-half hours' full power trial subsequently she made 20.2 knots, with engines developing 20,664 i.h.p., and a coal consumption of 1·98 lb. per unit of power per hour. On a further trial, at the beginning of this month, she again made over 20 knots, and on circle-turning trials proved to be a very easy moving boat.

UNITED STATES.

Four new battleships have been launched in six weeks for the United States, but this abnormal state of affairs does not indicate any feverish activity among the contractors, but serves rather to show that a large amount of work is in arrears. It has been possible to launch both the *Louisiana* and the *Connecticut* within sixteen months, and it ought, therefore, to have been possible to get the *Nebraska* and *Georgia* into the water in less than twenty-eight months. The extraordinary story of the launching of the *Georgia*, at Bath, Me., with steam up, does, to some extent, of course, explain the delay. But it seems incredible that after the exeperience in France with the *Republique*, which was launched, if I remember rightly, with all her guns and armour in position, and which, in consequence, was so severely strained, as to make it doubtful if she will ever be really seaworthy, the Americans could risk the loss of a really good fighting ship. Of course, it must not be lost sight of that neither the *Nebraska* nor the *Georgia* is a modern ship according to our standard. They approximate in design to our *London* and *Duncan* classes, all of which have been completed and in commission for at least twelve months. The *Georgia*, according to report, will not be ready for service until 1907, at which time our *Lord Nelson* class will just be taking its place in the fighting line. Sixty months is a long time to spend building a battleship nowadays, and changes can and do occur in that time to render the vessel almost obsolete by the time she is complete.

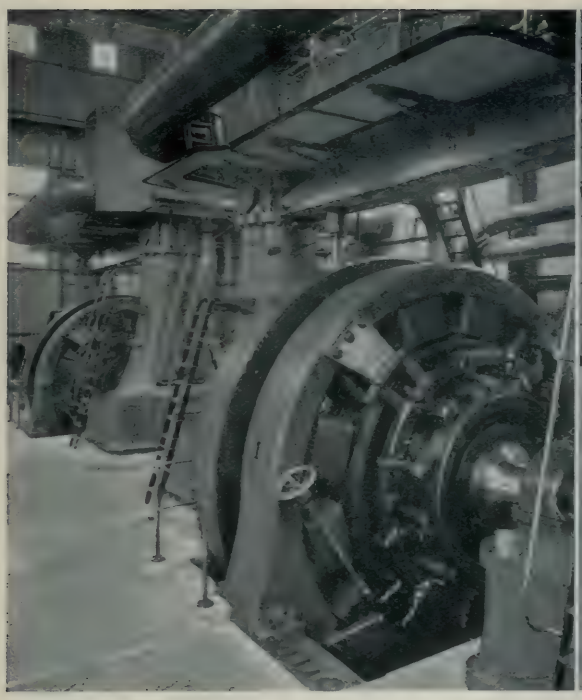
The following are the principal characteristics of the new armoured cruisers of the *North Carolina* class. In length they are to be 502 ft., with a breadth of 72 ft., and a displacement of 14,500 tons. The maximum h.p. is not mentioned, but the speed is to be 22 knots. The total bunker capacity is to be 2,000 tons, and the armament is to consist of four 10 in., sixteen 6 in., and twenty-two 3 in. guns, with the usual smaller pieces, and four submerged torpedo tubes. The hull will be protected by a water-line belt of armour worked in vertical strokes amidships, where it will be about 18 ft. in height, extending from the protective deck to the gun deck port sills, being stepped down at the ends. It will be of a uniform thickness of 5 in. throughout the machinery and magazine space, and 3 in. forward and abaft this. The upper side armour will be disposed in the wake of the 6 in. battery, and will extend from the gun deck port sills to the main or upper deck, and will be 5 in. thick throughout. Nickel steel, 2 in. thick, will be disposed in the wake of the 3 in. battery.

Athwartship armour of 6 in. uniform thickness will be fitted from the protective deck to the gun deck; also 5 in. armour in same location from the gun to the main deck. The upper and lower athwartship armour is to extend from the shell plating to the 10 in. barbettes.

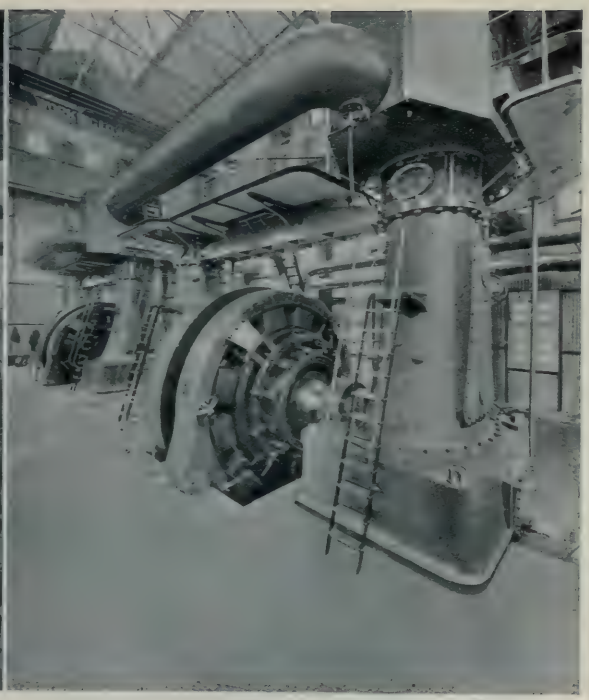


THE FRENCH SEA-GOING TORPEDO-BOAT "FILBUSTIER."

Built at Havre, launched 1894. Length, 141 ft. ; beam, 14·7 ft. ; draught, 9 ft. ; displacement, 120 tons ; I.H.P., 1,000 ; trial speed, 23·5 knots ; carries two torpedo tubes and two 3-pounder quick-firing guns ; coal capacity, 16 tons.



A Ross symmetrical lens of ordinary wide angle type was used for this view.



For this view the lens used was No. 3, Series V., Ross-Zeiss.

TWO VIEWS IN THE INTERIOR OF THE LOUGHBOROUGH POWER-HOUSE OF THE L.C.C. TRAMWAYS.
Taken from the same spot on Imperial special rapid 12 in. by 10 in. plates.

ENGINEERING PHOTOGRAPHY.

ONE of the difficulties met with in photographing engineering subjects is the small amount of space available for working in.

As it is usually of the utmost importance that as much as possible of the object should be shown in the photograph, lenses of a specially short focus have to be used. This is illustrated by the above views of the L.C.C. temporary generating station which were taken on 12 in. by 10 in. Imperial special rapid plates, without moving the position of the camera. For the left-hand photograph a Ross symmetrical lens of an ordinary wide angle type was used, but as it was impossible to place the camera further away so as to include the whole of the near engine, a No. 3, Series V., Ross-Zeiss lens of about half the focal length was substituted. A lens of such an extremely short focus is only used in very cramped positions as the perspective obtained is so violent. From the foregoing it will be understood what a great variety of lenses it is necessary for the engineering photographer to possess in order to produce successful results. The photographs were taken by Messrs. Booker and Sullivan, for Messrs. Dick, Kerr and Co., Ltd., who preferred the wide angle view. The two generators shown are installed in the Loughborough power-house of the L.C.C. tramways. They are continuous current compound wound machines of the multipolar type, each capable of giving an output of 1,500 kilowatts at 500–620 volts when running at a speed of 150 revolutions per minute, and will stand an overload of 25 per cent. for one hour. The generators are coupled to two vertical cross compound engines built by Messrs. Ferranti, Ltd.

The Cooper-Hewitt light, on which development a special article appeared in a recent number of PAGE'S MAGAZINE, has been ingeniously utilised for the purpose of biographing interiors by the Westinghouse Company. Hitherto the only alternative to clear sunlight for cinematograph work was the massing of arc lamps at prohibitive cost. The Cooper-Hewitt mercury vapour lamp has, however, solved the problem, and a film of over 6,000 ft. in length, dealing with many of the manufacturing processes of the Westinghouse Company, has been produced, and is being shown daily in the Westinghouse auditorium at St. Louis Exhibition.

PROFESSOR R. A. S. REDMAYNE, M.Sc., M.I.M.E., F.G.S.,

President of the South Staffordshire and East Worcestershire Institute of Mining Engineers.

PROFESSOR RICHARD A. S. REDMAYNE, whose name is prominently associated with the Applied Science side of the Birmingham University, is a native of Durham. Born at Low Fell, in 1865, he was originally intended for a military career, and to a certain extent his early education was based upon lines calculated to foster a martial character. After a course of private tuition, he was enrolled as a student of the Durham College of

Science. While attending this institution he wisely abandoned the idea of becoming a soldier, and, instead, began to concentrate his abilities on the study of matters appertaining to mining. He carried off all honours in connection with the science of geology, a fact which demonstrates his exceptional interest in the subject, and also forecasts his capacity for hard work.

In 1883 Richard Redmayne was apprenticed as an articled pupil to Mr. Thos. Lishman, manager of the Hetton Collieries, Durham. For eight years he was connected with these mines, and during the third year the Elemore Colliery was almost completely devastated by an explosion resulting in great loss of life. This calamity served to give him unique experience of the dangers of mining, as well as to suggest means for greater security; he also acquired a knowledge of the methods put into operation for the re-inauguration of mines after partial destruction, consequent upon fire damp or coal dust explosions.

At this period Mr. Redmayne successfully passed the Government Mining Examination, and obtained his manager's certificate. Working through the official grades, he was eventually appointed an under-manager. In 1891 he terminated his services with the Hetton Collieries in favour of a position in South Africa as general manager of a Natal coal mining company. He remained there for two years, adding vastly to his experience and impressing all with whom he came into contact with his unquestionable mastery of his profession. At the request of the Natal Government he surveyed and reported upon the underground workings of the Dundee Colliery, which suffered considerable damage during the late war. Another commission received by Mr. Redmayne was to report on the oil-shale and coal deposits in the Drakenberg Mountains. He was also called upon to give evidence before the Government Industries Committee, and, besides accepting a number of commissions to report on mining properties, Mr. Redmayne made time for supervising borings, surveying mines, designing and estimating the cost of colliery plant.

In 1893 he returned to England, and was appointed resident manager of the group of mines owned by the Seaton Delaval Coal Company in Northumberland. During his last two years with this firm he was responsible for opening out the new Hartley Colliery to a lower depth, and unwatering the Old Hartley Colliery, the working of which had been suspended for forty years in consequence of an appalling accident in which over two hundred lives were lost. The task was a dangerous one, involving great difficulties, but, under the experienced guidance of Mr. Redmayne, all obstacles were overcome, and the mine reopened for further exploitation.

Professor Redmayne's contributions to the literature of mining and to allied sciencies are numerous and authoritative. He has written a series of articles for the journal of the British Society of Mining Students, and in 1891 he was elected president of this Society—his presidential address being one which, in technical circles, evoked considerable discussion. In 1893 he was elected a Fellow of the Geological Society, and was awarded prizes by the North of England Institute of Mining Engineers and Federated Institute of Mining Engineers for his paper on "The Geology and Coal Deposits of Natal." Three years later, in collaboration with his friend Mr. H. F. Bulman, he published a work entitled "Colliery Working and Management"; he continues to edit the well-known annual, "The Colliery Manager's Pocket Book," and writes for many British and foreign technical magazines.

In March, 1902, Mr. Redmayne was appointed to the Chair of Mining at the Birmingham University; but before commencing his duties as Professor he was sent by the Council of the University to America in order to study the nature and methods of working the mining sections of the American and Canadian Universities. The information thus derived has proved advantageous in designing the curriculum of the mining department of the University. Supplementing the lecture-room studies, Professor Redmayne has arranged a scheme whereby the students obtain practical experience by means of week-end visits paid to the collieries in the vicinity of Birmingham, while about a month of the summer vacation is spent in mining districts further afield.

Professor R. A. S. Redmayne is a member of the North of England Institute of Mining Engineers, the Federated Institute of Mining Engineers, the South Staffordshire and East Worcestershire Institute of Mining Engineers (of which society he was elected president on Monday last; his presidential address will be found on another page), the American Institute of Mining Engineers, and the Institute of Mining and Metallurgy. In 1902 the University of Birmingham conferred upon him the degree of Master of Science. With the sanction of the Treasury, he was appointed to render expert mining assistance to the Royal Coal Commission for the Midlands, and to the University of Wales he is External Examiner in Mining and Mine Surveying.

THE FIRE AND SALVAGE STEAMER "FIREFLY," WHICH HAS JUST BEEN COMPLETED FOR USE ON THE MANCHESTER SHIP CANAL.

ENGINEERING DEVELOPMENTS OF THE WEEK.

ILLUSTRATED.

New Fire and Salvage Steamer.

OUR illustration shows the new fire and salvage steamer *Firefly*, built by Messrs. Merryweather and Sons, Ltd., to the order of the Manchester Corporation for use in the Ship Canal. The *Firefly*, which is the most powerful boat of the kind yet put into service, cost a sum approaching £10,000 to build. A noteworthy feature is that the boat only draws 3 ft. of water. The hull, which is of steel, is 90 ft. long, by 23 ft. beam.

The *Firefly*, which has a speed of about eight knots, is of the twinscrew type, and is fitted with a pair of vertical compound non-condensing engines. The fire pumps, capable of delivering 2,000 gallons per minute, are of the horizontal "Greenwich" type, and they can be worked together or separately. Monitors are fixed amidships and aft, each fitted with two sets of worm gear, enabling the monitor to point in any direction and at any angle. There are two salvage pumps of the centrifugal type, each of which is capable of delivering 2,500 gallons per minute. The vessel has passed successfully through her trials. The pumps worked well, and the 3½ in. nozzles which were used threw a solid jet of water to a height of 100 ft.

Notable Contracts.

Messrs. Dick, Kerr, and Co., Ltd., have carried out the laying of nearly two miles of tramway track, with numerous complicated junctions, in twelve weeks, at Birmingham. This has been done without any absolute stoppage of steam-tram traffic, which sometimes amounted to a thousand cars per day along the route affected. Sixteen weeks were allowed for the work in the contract.

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The Fulham Steel Works Company, of Townmead Road, Wandsworth Bridge, London, S.W., have secured the order for a large number of steel bridges for the Burma Railway Company. The whole of the material to be used will be of British manufacture. The contract has to be completed within the next six months.

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Messrs. T. Sugden, Ltd., 180, Fleet Street, London, E.C., have secured an order to instal fourteen of their superheaters in connection with the Lancashire boilers for the City of Birmingham Electricity Works.

Improved Spoke Bending Machine.

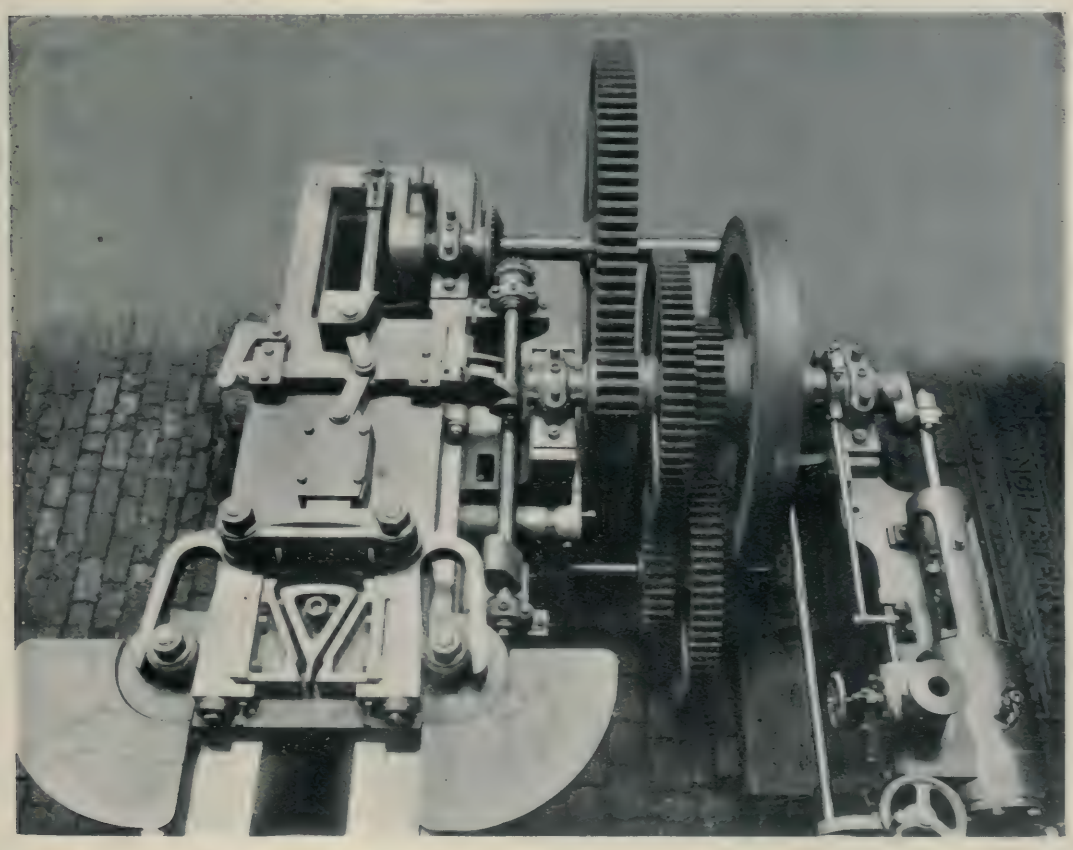
We illustrate a plan photograph of an improved spoke bending machine, for bending to the required shape the wrought-iron spokes of railway carriages and wagon wheels. The machine has an automatic motion for raising the spoke after being bent, to enable the attendant to take it from the machine easily. The blocks which form the spoke are clearly shown in our illustration. The back block is arranged to slide back to admit thick-backed spokes, and the side blocks are formed to produce a smooth curve on the shoulder at each side without leaving a fin.

Coupled to the machine is a suitable powered steam engine which gives motion to the sliding blocks through treble gear, and the machine is stopped and started by friction-clutch and hand wheel placed in a convenient position for the operator. The tool embraces many improvements in design and detail over previous ones, and has recently been supplied by Messrs. Cunliffe and Croom, Ltd., of Manchester (the makers) to a large firm of railway carriage and wagon builders in the north.

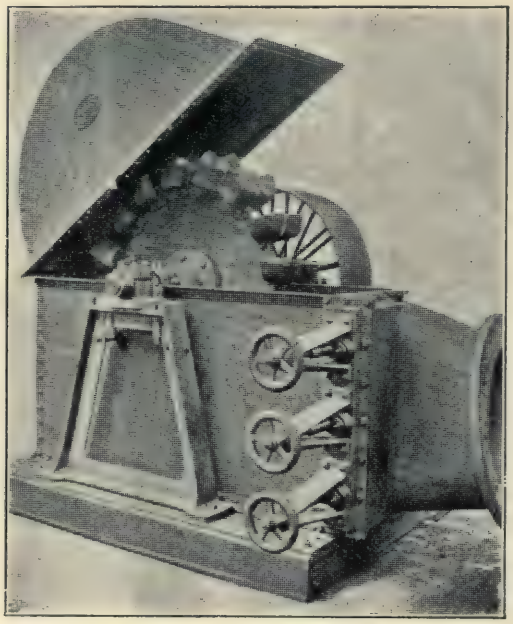
Hamstead Colliery.

An awkward feature about the working of the Hamstead Colliery, which was recently visited by the Institute of Mining Engineers, is that the coal, on account of its thickness and depth, is liable to spontaneous combustion; also "bumps" frequently occur. These, Mr. L. Holland informs us, are caused by the pressure of the seam relieving itself, or more correctly the tension of the seam, as it may be compared to a piece of iron sheet bent until it suddenly snaps. The force of these "bumps" is sometimes so great as to break through the settings or crossbars which support the roof. The whole of the haulage of this colliery, both above and below, is done by endless ropes. The cylinders of the winding engines are 44 in., with a 7ft. stroke, and the drum is 22 ft. in diameter and weighs 80 tons. It is fitted with a steam as well as a foot brake. The engines exhaust into a condenser, worked by a beam engine with a 31-in. cylinder. The headgear is constructed of wrought angle iron and lattice work.

The cages (built by E. C. and J. Keay) are made of



IMPROVED SPOKE BENDING MACHINE BY MESSRS. CUNLIFFE AND CROOM, LTD., OF MANCHESTER.



THE PITMAN-PELTON WHEEL.

steel, and weigh about 75 cwt. each. They contain three decks, and carry six tubs. At the pit bottom the lower decks of the cages are fed by balance cages, which lower the full tubs from the top landing to the middle and bottom ones, and raise the empty tubs to the higher landings. By this method the three decks of the shaft cage are loaded simultaneously. The pit top is laid out on similar principles.

The water is pumped up from a lodge room 600 ft. below the top of the upcast shaft.

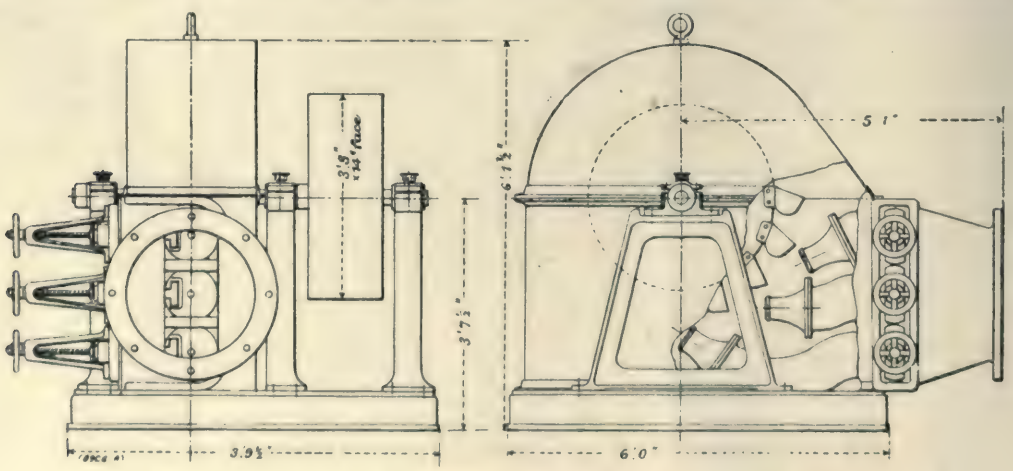
The engine is of the "Bull" type, with a cylinder of 40 in. diameter, and 6 ft. stroke. The ram of the pump is 9 in. diameter, and forces the water up 10½-in. mains. The pit is ventilated by a Guibal fan, 36 ft. in diameter, which produces 100,000 cubic feet of air per minute when running at forty-five revolutions per minute.

The Pitman-Pelton Wheel.

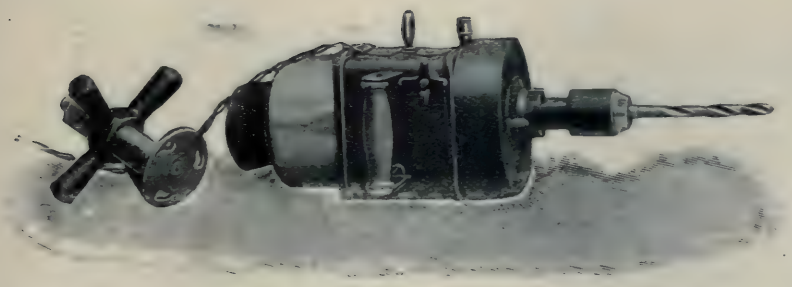
The 50-h.p. Pelton wheel, illustrated on this page, has been designed by Mr. Percy Pitman, of Ledbury, who makes a speciality of high-pressure wheels to work off hydraulic power mains and low-pressure motors for use in connection with the ordinary local town water supply. It runs at 135 revolutions when consuming 700 cubic feet of water per minute with a head of 50 ft. As will be seen from the diagrams, the water after entering the inlet pipe impinges upon the wheel from three separate nozzles, which are governed by hand valves.

Mr. Pitman guarantees a maximum drop of speed of 3 per cent, only during instantaneous change from full load to no load when these wheels are fitted with speed governors, and an efficiency of not less than 80 per cent. In this case a plate of metal is hinged to the end of one of the nozzles deflecting more or less the stream of water. The governor is of the centrifugal type, and actuates this device by means of a pair of bevel wheels and worm gearing, the action being such that if the speed is, say, too high, one of the bevel wheels comes into play; but if the speed is too low the other bevel wheel is actuated. The deflecting plate can also be operated by hand.

Several of these Pelton wheels are now being worked from steam pumps, all the exhaust water being returned to the pump and used continuously.



SECTIONAL PLAN AND ELEVATION OF THE PITMAN-PELTON WHEEL.



NEW ELECTRIC HAND-DRILLING MACHINE BY MESSRS. S. WOLF AND CO.

A New Electric Hand-Drilling Machine.

By the courtesy of Messrs. S. Wolf and Co., we illustrate a new electric hand-drilling machine with three speeds, which has been designed by them for use in engineering works. It is one of a series of portable machines specially built for drilling holes under difficult circumstances precluding the use of a stationary drilling machine, and is capable of drilling up to $\frac{9}{16}$ in. diameter. The change of speed is effected through sun and planet cut gear, and the three speeds which can be obtained are 600, 350 and 200 revolutions per minute respectively. The switch, which can be operated while the drill is in hand, is fitted inside the frame of the machine, and a reversing switch for tapping purposes can also be employed. When the drill is employed for drilling under a stand post the breast plate can be exchanged for a feed wheel and spindle. The weight of the machine is about 20 lb.

The Researches of M. Pierre Breuil.

Possibly few of those who saw M. Pierre Breuil receive the Carnegie gold medal from the hands of the president at the May meeting of the Iron and Steel Institute, were able to fully realise the amount of laborious research involved in his paper: "Relations between the effects of stresses slowly applied, and of stresses suddenly applied in the case of iron and steel; comparative tests with notched and plain bars."

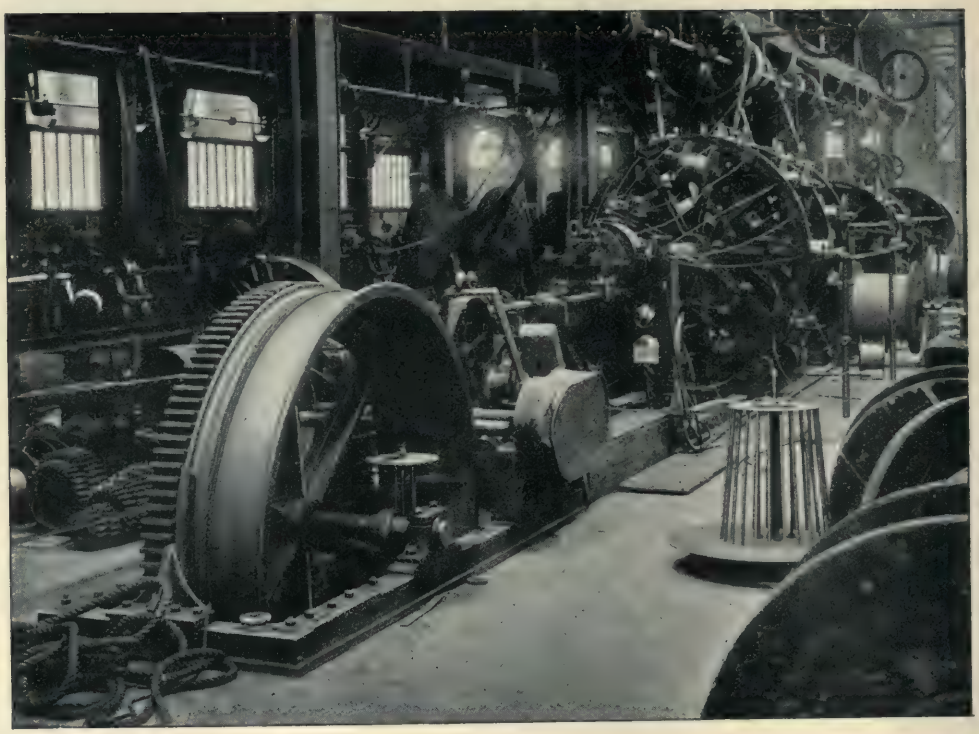
The excellent reprint, edited by Mr. Bennett H. Brough, now issued as a supplement to Vol. LXV. of the Journal, will serve to show how well Mr. Carnegie's encomiums were deserved. The problem, as the author remarks, is an old one which has tempted many an experimenter. It is also a large one, and even with the resources of the testing laboratory of the National Conservatoire des Arts et Métiers, at Paris, in which M. Breuil has charge of the metallurgical section, he was obliged to be content with an investigation of the slow tensile tests, slow bending tests, and impact bending tests, under conditions which "might with advantage have been still more fully amplified."

Attention was particularly directed by M. Breuil to the study of the influence of the form of the test specimens, and it was decided to investigate the method of testing by nicked test pieces, which was introduced in France some years ago, and is causing much stir at the present time. In the author's opinion, the attempt to replace the old methods of investigation by the new system is being made without adequate reason. He shows that the notching of bars must be carried out in accordance with certain rules if it is to lead to conclusions of any value.

In the author's opinion, the tests with bars notched in different ways resemble tests made with pieces of the same metal, but of various forms. The manner in which the piece behaves in each case may be accurately studied, but that does not furnish a good criterion of the intrinsic properties of the metal, as would a test with a bar of simple form, such as a plain bar. The only advantage of the notched bar is to enable even the extra soft steels, in a bending test to be fractured, subject to the condition that the notch is sufficiently deep. But is it absolutely necessary to break these bars? If so, it could be done without notching by taking a flat bar and bending it on the narrow side. All that is wanted is an amount of deformation sufficient to produce rupture, and all depends on learning the volume of metal affected. In all cases where it is desired to operate with notched bars it would be preferable to use them as tensile test bars, rather than as bending bars, as the risk of error is thereby reduced.

Finally, the most important conclusion to be drawn from these tests is that a slow action produces the same effects as a sudden action upon metals (at least upon those which the author has investigated). It is therefore preferable to adopt tests of the former type rather than tests of the latter type, since the first-named are more exact.

This latter conclusion, says M. Breuil, appears paradoxical, and may perhaps shock many inquirers who are accustomed to believe that there is a vast difference between the effects of the two kinds of stress. A complete analysis of the phenomena would not fail to convince them that appearances in this respect are misleading.



STRANDING MACHINE IN MAIN CABLE SHOP OF THE ST. HELEN'S CABLE COMPANY, LTD.

The Manufacture of Dialite Cables.

Some interesting details have just come to hand, from Messrs. The St. Helen's Cable Company. Ltd., covering the manufacture of their dialite cables. We are also indebted to this Company for the accompanying view taken in their factory.

The methods of manufacturing this cable are as follow: The strand is laid up in the same way as for any ordinary cable, with the exception that the outer layer is composed of tinned copper wires. The raw materials which form the component parts of dialite are first of all thoroughly refined and filtered by means of hydraulic presses, etc. They are then mixed together by means of mixing machines specially designed for this material, and then laid in to a form of tape, varying in width according to the size of strand over which it is intended to be laid.

It is in the mixing and vulcanising processes that the secret of success in connection with this cable is contained. Dialite is applied to the strand before vulcanising, and may be put on either by lapping with dialite in the form of tape, or it may be squirted on. The former process gives the best results, and is always employed in the manufacture of dialite cables. A single proof tape is put on over the dialite, and the whole cable is then vulcanised. After this, it is put into a tank of water for twenty-four hours, and is then subjected to a test for insulation resistance, and a high pressure test for its disruptive strength.

After the cables have satisfactorily passed these tests, they are covered with a fine braid or a heavy jute serving, according to the conditions under which it is intended to lay them. They are then served with a preservative compound, and the finished cable, after another test for insulation resistance to discover whether any damage has occurred during the last processes, is despatched to the stores and thence to its destination.

The Brush Electrical Engineering Company, Ltd., Loughborough, have received an order from the City of Birmingham Tramways Company for forty complete tramcars with radial trucks.

Ten locomotives for the Canadian Pacific Railway, which have been under construction at Toronto, have been completed. This is the first time locomotives have been built in Toronto for fifty years.

BRITISH NAVAL WORKS IN PROGRESS.

Their Estimated Cost and Expected Date of Completion.

The following details are from a Government return just published :—

Works.	Total Estimated Cost, 1903.	Estimated Expenditure.		Expected Date of Completion.
		1903-4.	1904-5.	
(*a.*) **Enclosure and Defence of Harbours.**	£	£	£	
Gibraltar	1,289,000	34,300	53,477	1904-5
Gibraltar, Commercial Mole	669,000	111,000	146,212	1904-5
Portland	650,000	62,800	52,814	1904-5
Dover	3,500,000	515,000	335,174	1907-8
Malta Breakwater	1,000,000	6,300	150,177	1909-10
(*b.*) **Adapting Naval Ports to present needs of Fleet.**				
Deepening harbours and approaches	1,300,000	80,731	106,269	—
Keyham Dockyard extension	4,175,000	499,000	450,121	1906-7
Portsmouth Docks	372,502	—	—	Completed
Gibraltar Dockyard extension	2,809,000	487,000	260,200	1905-6
Hong Kong Dockyard extension	1,245,500	243,000	307,242	1905-6
Colombo Dock	159,000	27,060	22,940	1905-6
Pembroke Jetty, &c.	130,000	9,100	38,318	1904-5
Portsmouth—Widening Caisson	40,466	—	—	Completed
Haulbowline improvements	62,599	—	—	Completed
Chatham Dock	450,000	92,563	81,295	1904-5
Malta Dockyard extension	1,250,000	141,250	331,750	1907-8
Bermuda Dockyard extension	700,000	61,700	79,888	1907-8
Simon's Bay Dockyard extension, &c.	2,500,000	100,000	100,078	1907-8
Coaling facilities and fuel storage	1,280,000	262,299	363,193	1906-7
Chatham Dockyard extension	*50,000	1,770	48,230	—
Sheerness Depôt for Torpedo-boat Destroyers	250,000	6,829	116,171	1906-7
Naval Establishment at Rosyth	*200,000	150,105	9,895	—
(*c.*) **Naval Barracks, &c.**				
Chatham Naval Barracks	515,000	34,000	39,473	1905-6
Gunnery Schools†	470,000	1,000	42,732	1906-7
Portsmouth Naval Barracks	791,400	81,000	113,726	1905-6
Keyham Naval Barracks	281,000	16,000	73,809	1905-6
Chatham Naval Hospital	429,000	51,000	99,022	1905-6
Walmer Marine Depôt	17,658	—	—	Completed
Keyham Engineers' College	23,298	—	—	Completed
"Britannia," R.N. College	375,000	60,982	146,635	1905-6
Magazines	1,335,000	106,381	332,595	1906-7
Haslar Hospital extension	68,265	297	—	Completed
Haulbowline Zymotic Hospital	12,868	—	—	Completed
Coastguard stations and Royal Naval Reserve Batteries.	*50,000	14,000	76,000	—
Torpedo ranges	320,000	50	19,950	1906-7
Electric light and power in Naval Establishments	1,500,000	48,970	454,030	1908-9
(*d.*) **Superintendence and Miscellaneous Charges**	1,420,303	101,400	130,584	—
Total £	31,640,859	3,407,387	4,582,000	—
		£7,989,387		

* This is a token sum only, and does not represent the total estimated cost.
† Includes the item formerly described as "Naval Barracks for Medway Gunnery School."

THE SHAW ROCK DRILL.

Constructed by the Shaw Rock Drill and Machinery Co., Ltd.

THE above is the latest addition to this class of machinery, and its advent this week is interesting in view of the strong claims advanced on behalf of those responsible for its introduction. A representative of PAGE'S WEEKLY has seen the machine in operation at the depot in Finsbury, and is therefore able to write from personal observation.

The main features claimed for the new drill are simplicity of design and automatic working, with a view to limiting the responsibilities of the operator. One is familiar with the sort of treatment which is generally meted out to rock drills. Machines in general are placed in charge of a skilled mechanic, who is supposed to bring to bear on his work a reasonable degree of intelligence, but it is usually considered that the most ignorant labourer can handle a rock drill, and the results are not as a rule too encouraging. It would appear that the Shaw drill is less likely to suffer from careless handling than the average rock drill.

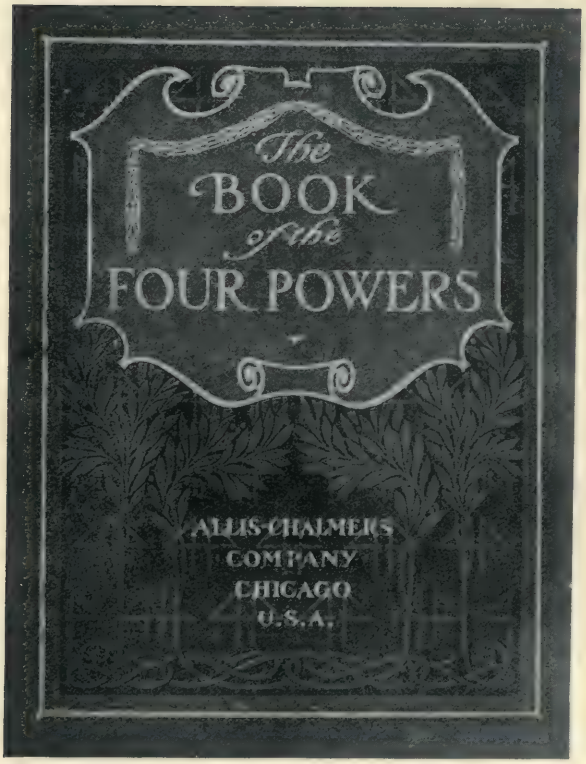
The drill is quite simple in construction. It has only four parts, and there is little or nothing to get out of order. The additional claims are put forward that it is practically unbreakable, that it cannot be overfed, has no valves to adjust, no side rods or heads, no chuck bolts and no packing. It is but one-fifth the weight of other drills, is said to take but one-fifth the power, and has no screw feed.

A novel contrivance is the automatic forward-feed. The air comes in when the hammer is at the rearward position, and the smooth part being in contact with the shoulder, the air cannot pass forward. The result is, that the air fills up the back of the machine and the pressure behind throws the hammer forward. To prevent recoil the air is exhausted by two special ports, and air then flows in and starts the machine again. It seems simplicity itself, and the machine is said to be capable of striking 2 000 blows per minute. There have been automatic feeders before the Shaw drill, but, being geared, they always went forward at the same speed, whereas in the case of the Shaw drill the inventor claims that, no matter what kind of rock or seam is being drilled, the machine at once goes forward to the face.

Another point about the drill is that the steel has a hole drilled right through it so that the dust can be blown away and so prevent the head from being choked, while water can be sent through the hole if desired to kill the dust. A change is made from the ordinary bit, a wagon-wheel bit, with fourteen cutting edges, being employed, in place of the usual four, and it is not therefore considered necessary to rotate the steel, but

simply to give it a slight lateral movement when working to change the strike of the bit. In the ordinary way the machine is mounted on a column and arm to obtain the necessary rigidity, but it can be used without these adjuncts, and can herefore, it is said, be taken into the narrowest stope where, perhaps, it would be impossible to use the smallest of the standard types

of rock drill. It is claimed for the Shaw that it will cut as much rock as the standard type machines, and that when the time occupied in changing bits is reckoned, it will do more work owing to the rapidity with which the bit can be changed. The drill is already in operation at many mines in Colorado, Mexico, and Arizona.



CATALOGUE COVER DESIGNS.

"The Book of the Four Powers."

THE beautiful design here reproduced forms a fitting cover to one of the best specimens of commercial printing we have seen this year. It is rendered, for the most part, in rich browns. the foliage and panel being olive green, while the wording and the outer boundary lines are produced in gold. The striking combination of the numeral, 4, dominates the cover and also the end papers. It is emblematic of the title: "The Book of the Four Powers"—steam, gas, water, and electricity. The Allis-Chalmers' prime movers embracing steam engines, steam turbines, water turbines, and gas engines, find ample representation in notable plants, and the numerous photographic reproductions which brighten these artistic pages are literally a triumph of the engraver's art.

Modern Machine Tools.

The lower design is that used by Messrs. Dean, Smith and Grace, Ltd., for their catalogue of modern machine tools. The design is carried out in green and buff on a steel gray background with foliated design. The white panel with machine tool illustration is gummed to the cover, the whole presenting a very artistic and somewhat novel scheme.

THE ENGINEER'S BOOK OF THE WEEK.

"WARSHIPS."

THE production of this book has clearly been a labour of love with Mr. Attwood. He has brought to bear on his subject not only the ripest expert knowledge, but an enthusiasm which at times glows white hot like metal in the forge. The story of the modern battleship, the fighting power of which has been so clearly demonstrated in Eastern seas, is alive with interest. Beyond the written word there is a whole world of suggestion running through the volume. One sees the long struggle between armour which beats the gun and the gun which is again the master; and to the reader with imagination is conjured up a picture of the beginnings of our fleet, of fights with Spanish galleons, of Drake and Frobisher, and that long line of men and ships which won and kept for England the mastery of the seas. There is no suggestion that Mr. Attwood has in the least attempted to sacrifice soundness to popularity; he has recognised that his book is intended primarily for the use of naval officers, and there is an appendix in the form of questions, which certainly adds to the usefulness of the work. The author has, however, never forgotten what is due to his subject, and the construction of battleships is a matter of such national interest and importance, and one, moveover, on which there is so little existing literature, that this volume ought to be widely read.

The first part of this timely publication deals with the structure and fittings of modern warships, which it needs no special training to understand; the second half of the volume is more purely theoretical in style, and will be caviare to the general reader. The whole work is profusely illustrated, which gives the letterpress that clearness which is an essential feature of a text-book. The author explains the different types of warships, from first-class battleships to torpedo-destroyers, but the submarine is still veiled in secrecy, and Mr. Attwood does not permit himself even a chance reference to the new terror of naval warfare. Our illustrations, giving sections of the different types of warships, show the variation of structure. A distinctive feature of the first-class battleship is, as is well known, is the provision of an inner skin up to the protective deck. As a matter of fact, the inner coal bunker bulk-head gives three skins on the beam side and bilge. It may be noted that all ships of the Royal Navy, above third-class cruisers, have the double bottom, while, to meet the nature of the chief straining to which these ships are subjected the main framing in on the longitudinal system, the transverse framing being intercostal, except at the ends, where longitudinal strength is of less importance and the main functions of the framing is to stiffen the outer bottom plating. The broad distinction between a battleship and cruisers of the first class is that the former has thicker armour and heavier armament, while the latter has lighter protection and armament, with higher speed.

One thing the author brings out very clearly that in the building of warships there is no such thing as fixity of design, or finality in construction. The work is essentially progressive. It used to be the fashion to give cruisers a bottom sheathing of wood and copper to prevent fouling, but with better dry dock accommodation, the necessity for sheathing has departed, with the result that it is possible to make cruisers more speedy, and in the case of a cruiser speed is, of course, a main consideration. Fig. 1 shows a section of a sheathed cruiser. H.M.S. *Diadem*. In the first-class cruiser type, in consequence of the great power of the engines, the framing in the engine

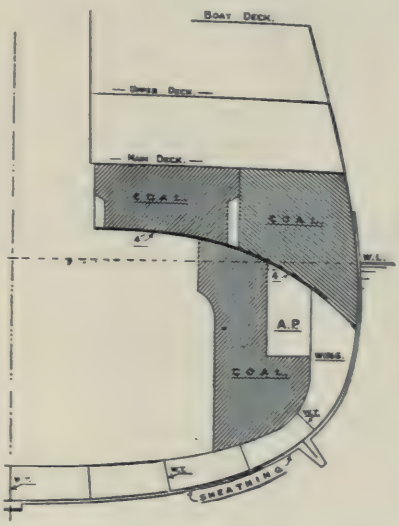


FIG. 1. SHEATHING OF H.M.S. "DIADEM."

WAR SHIPS. By Edward L. Attwood, M.Inst.N.A. With numerous diagrams. Longmans, Green, and Co. 10s. 6d.

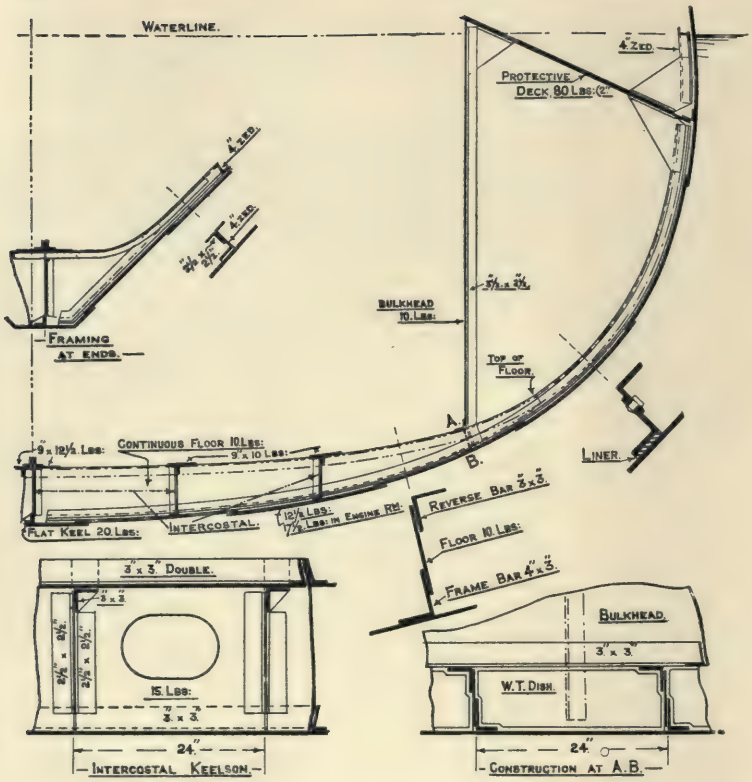


FIG. 2. FRAMING OF THIRD-CLASS CRUISER.

room is built exceedingly strong. Fig. 2 shows the framing of a third-class cruiser, which illustrates a different combination of conditions. There is no double bottom, and the plating being of small thickness requires to be well stiffened. For such vessels, the transverse system of framing is employed.

When Mr. Attwood writes of water-tight bulkheads he gets on to controversial ground. The dangers to which vessels of war are exposed have increased during recent years, and the question of longitudinal and transverse bulk-heads is not yet settled. The transverse bulk-head go, as the name implies, transversely across the ship, and the most important of these is the collision bulk-head, the one nearest the stem. The principal longitudinal bulk-heads are the middle line engine-room bulk-head, and the coal bunker bulk-heads. The engine-room bulk-head needs to be particularly strong in view of the strain thrown upon it in the case of the flooding of one engine-room. The whole question is one of the greatest importance and the longitudinal division of the engine-room is a point to which criticism has been particularly directed. On the subject of water-tight doors, which are of three types—hinged, vertical, and horizontal sliding, the author make a reference to automatic doors, but apparently expert opinion is against their use. It is reckoned that the doors can be secured in a battleship in from three to four minutes.

The chapter on stems, sternposts, rudders, and shaft brackets is interesting, because of the evidence it affords of the strenuous efforts being made to deal with difficulties in this connection. It is clear that this problem is still in the experimental stage. The main function of the sternpost in modern warships is to receive the rudder, the vessels being twin screw, and an essential condition is that the stem shall be so formed that the rudder and steering gear are well below the water and under protection. In the latest battleships of the *Edward VII.* class the rudders have a portion of the area before the axis, and cruiser rudders are always balanced by reason of their high speed, the

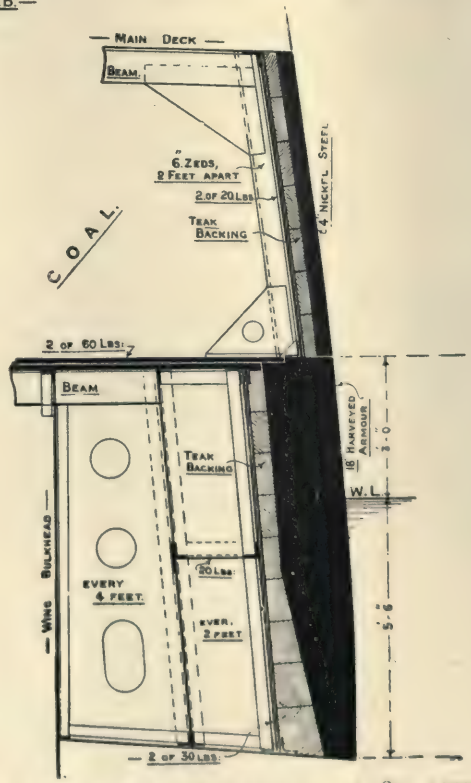


FIG. 3, SHOWING FRAMING BEHIND THE 18IN. ARMOUR OF THE "ROYAL SOVEREIGN."

pressure per square foot of rudder area increasing as the square of the speed. With a balanced rudder, the water pressures about the rudder head is small even at high speeds. The steering gears

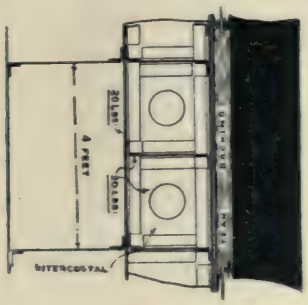


FIG. 4. ARRANGEMENT OF ARMOUR BACKING.

used in the Navy have been mainly compensating gears, although all the new ships of large size are being fitted with the non-reversible screw steering gear, by which the rudder in any position is locked. The chapter on coaling, reminds us that the use of liquid fuel is still in the experimental stage.

On the subject of armour and deck protection, Mr. Attwood writes interesting enough. He deals with the dangers of ramming, torpedo, or mine attack, and gun fire, and traces the history of protective armour from the 4½ in. armour of the *Warrior*, 1859, down to the present day. It was in 1873 that, owing to the successive improvement in guns, a stage was reached when it was found impossible to cover any large area of a ship's side with armour thick enough to resist the fire which would be brought against it, and the next development consisted in only attempting to protect a portion of the ship with very thick armour, and to leave the rest in a measure in the hands of fate. What the expert decided was to efficiently protect amidship, a principle which was carried to its extreme limit in the *Inflexible*. Then, in 1880, came the development of quick-firing guns, and high explosive shell, and our naval constructors had to meet the new conditions. This led to the construction of the *Royal Sovereign* class of ship, which were more heavily armour-sheathed, to be followed by the *Majestic* class with which Harvey steel was first employed as being superior to compound armour. Then came the Krupp steel for armoured ships, and the building of new types of ships to meet the constantly varying conditions. A massive system of framing is always provided behind armour, and figs. 3 and 4 show the framing behind the 18-in. armour, of the *Royal Sovereign*, while figs. 5 shows the *Cressy* 6-in. armour, supported by 10-in. zed bars. So much for modern defensive armour. The dangers to warships would appear to be multiplying faster than the wit of man can devise protection. As for the ram, it threatens to become obsolete one day; it is fraught with so much danger to attacker as well as attacked.

It is however, impossible to do full justice to Mr. Attwood's book here, and nothing but a very brief summary has been attempted.

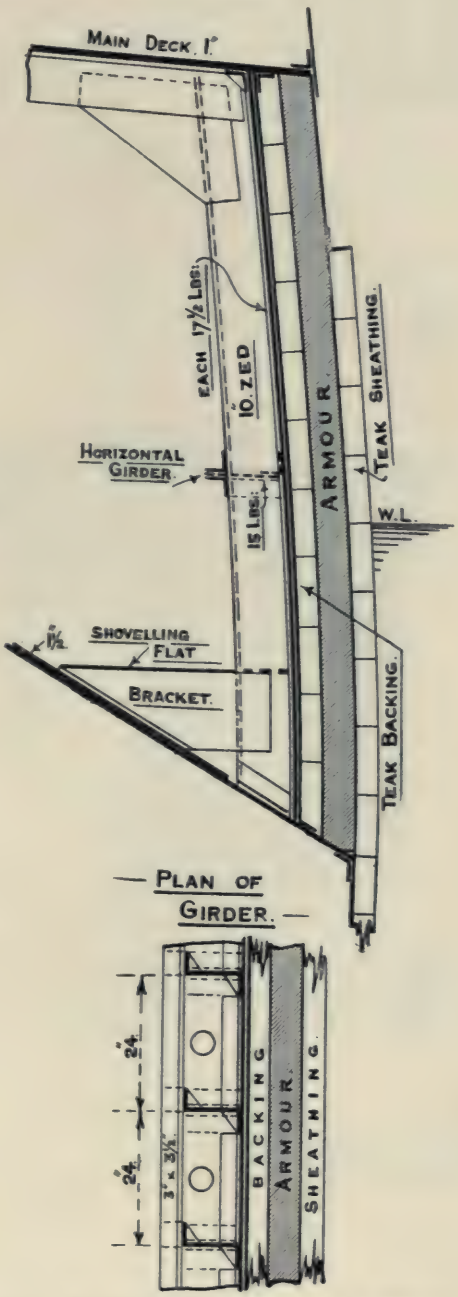


FIG. 5. SUPPORT TO "CRESSY" 6 IN. ARMOUR.

AN AUTOMATIC OIL PUMP FOR LOCOMOTIVES.

CONSTRUCTED BY MESSRS. RICHARD KLINGER AND CO., LONDON.

THE Klinger automatic oil pump for locomotives (fig. 1) is a combination of several automatic lubricators, all working independently and pumping just the quantity of oil for which each lubricator is set. It follows that one pump can be employed for the simultaneous lubrication of any number of parts.

The working mechanism of the apparatus is illustrated in fig. 2. The double eccentric (*E E*) rotated by the lever (*L*, fig. 1), imparts to the self-tightening plungers (*p* and *q*) an up-and-down motion. The plunger (*p*) sucks in the oil from the oil reservoir through the opening (*o*), and thence through the upper hole of the small chamber (*y*). The descent of the plunger (*p*) forces the oil through the lower hole of the small chamber (*y*) into the compression chamber (*K*). The relative movements of the two plungers (*p* and *q*) are such that the compression chamber is never in direct communication with the oil reservoir.

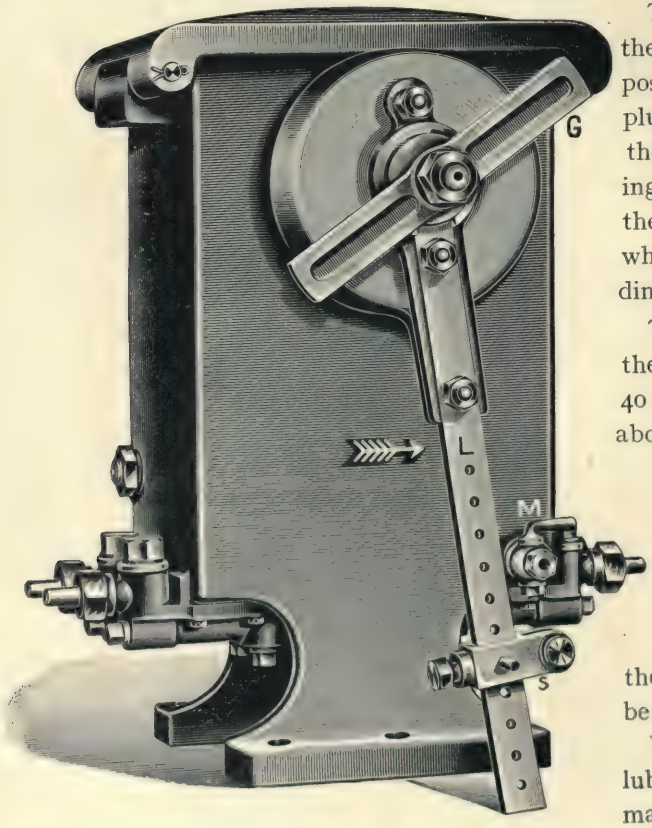


FIG. 1. THE KLINGER AUTOMATIC OIL PUMP FOR LOCOMOTIVES.

The delivery of oil from the lubricator depends upon the length of the stroke of the lever (*L*). If the adjustable clamp (*S*, fig. 1) is moved towards the ratchet wheel, the lubricating action is accelerated.

The rate of feed of each pipe depends upon the stroke of its particular plunger. In the position shown in the section (*fig.* 2), the plunger delivers the maximum quantity of the lubricant, because the top of the regulating screw (*R*) is level with the upper edge of the slide (*e*). In proportion to the extent to which the regulating screw is raised, the feed diminishes.

Thus, in the case of a compound locomotive, the high-pressure valves may be allowed about 40 per cent., the high-pressure cylinder about 25 per cent., the low-pressure valve about 20 per cent., and the low-pressure cylinder about 15 per cent. of the total amount of oil delivered by the apparatus. Under these conditions, the regulating screw (*R*) would remain untouched in the case of the high-pressure valve, while for the other parts their respective screws would be raised in proportion to the figures given.

With twin steam engines the ratio of the lubrication of the valves to that of the cylinders may be calculated as 4 to 3, and when the lubricators are set to this proportion it is advisable to maintain this relation permanently

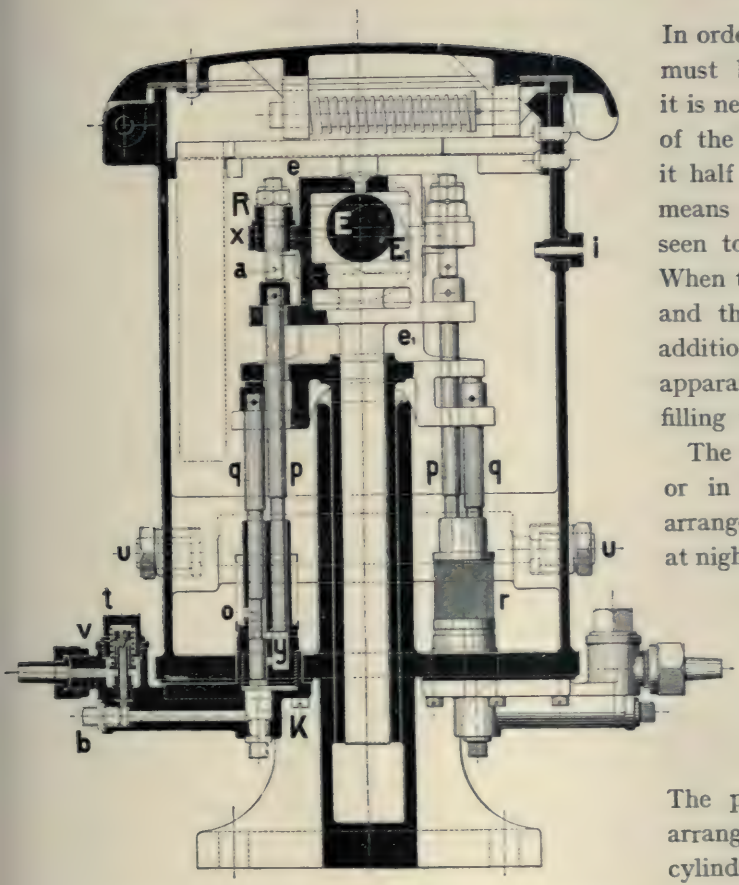


FIG. 2. WORKING MECHANISM OF THE APPARATUS.

and to effect any further adjustment by regulating the stroke of the lever (*L*, fig. 1).

The apparatus is driven by means of a ratchet wheel mounted on the shaft of the eccentric and actuated by the lever as shown in fig. 1.

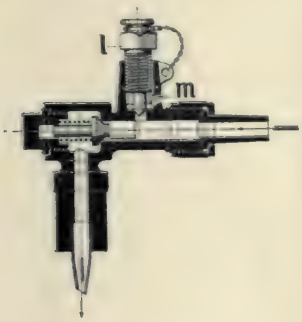


FIG. 3. BACK-PRESSURE VALVE.

In order to start it for the first time, the pipes must be filled with oil. For this purpose, it is necessary first to open the regulating screw of the back-pressure valve (*l*, fig. 3) by giving it half a turn. The crank is then turned by means of the handle (*G*, fig. 1) until the oil is seen to escape from the opening (*m*, fig. 3). When the pipes are full the screw (*l*) is closed, and the crank is given from thirty to forty additional turns. Once this is done, the apparatus requires no further attention than filling the reservoir from time to time.

The lubricator may be fitted near the driver or in front, near the cylinders. The first arrangement facilitates supervision, especially at night time, but necessitates longer piping and the provision of adequate space on the stoker's side of the engine. It is more usual to locate the lubricator in front, in order to derive its motion from the cross-head, while, of course, the length of the piping is diminished. The plan on page 454 shows the complete arrangement of the quadruple pump on a two-cylinder locomotive, with outside cylinders.

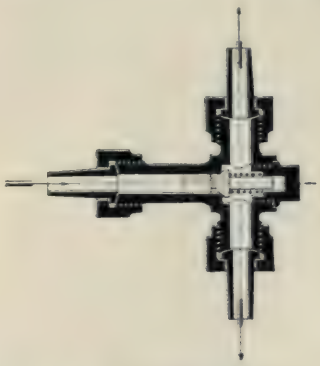


FIG. 4. BACK-PRESSURE VALVE WITH BRANCH PIPES.

The advantages claimed for the Klinger apparatus are summarised as follows: The feed is always proportional to the number of revolutions of the engine; during stoppages the supply of oil ceases; the delivery of the oil is independent of the pressure at the point

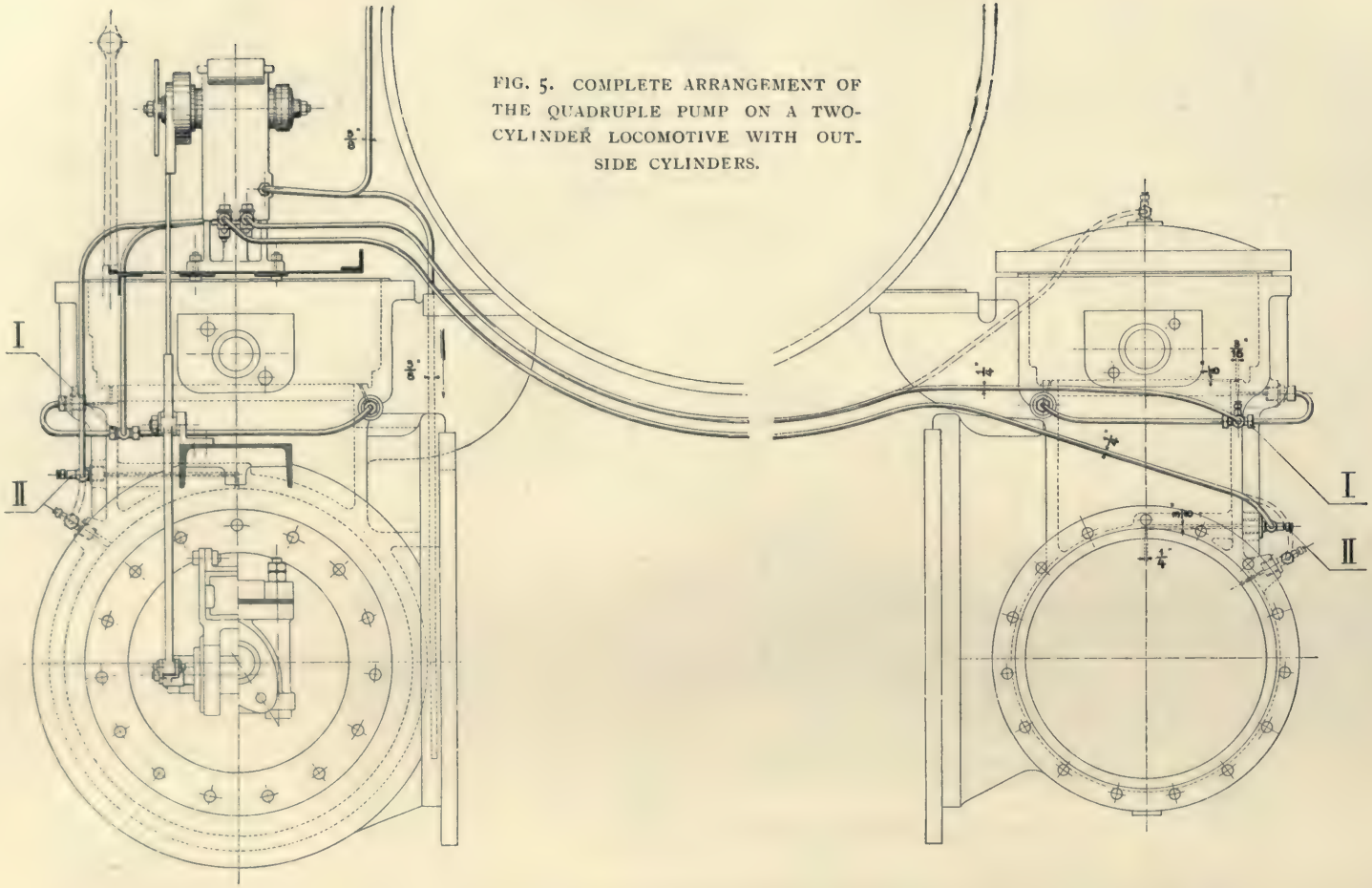


FIG. 5. COMPLETE ARRANGEMENT OF THE QUADRUPLE PUMP ON A TWO-CYLINDER LOCOMOTIVE WITH OUTSIDE CYLINDERS.

of application; the oil is conveyed direct to the surfaces which are to be lubricated. It is possible to lubricate surfaces untouched by steam; a commingling of the oil with the steam occurs only in a very moderate degree, and in any case only at the point of immediate application—therefore, there is no saponification of the oil; the filling of the oil reservoir is an easy operation; the oil reservoir is not under pressure; any kind of lubricating oil can be used.

THE WEEK AMONG THE TECHNICAL SOCIETIES.

The South Staffordshire and East Worcestershire Institute of Mining Engineers.

PRESIDENTIAL ADDRESS BY PROFESSOR R. A. S. REDMAYNE.

THE annual meeting was held on October 17th at Birmingham. The President said: Gentlemen,—Before entering upon the task appointed to me to-day, permit me the pleasure of thanking you for the great honour you have conferred upon me in having elected me to fill the presidential chair of this Institute for the ensuing year, a chair, gentlemen, which has been occupied with such grace and distinction by able predecessors, whose good example, though incapable of emulating, I shall do my utmost to follow. I think I am correct in stating that the South Staffordshire and East Worcestershire Institute of Mining Engineers has been in existence for thirty-seven years, and contains at the present time 147 members, five associated members, five associates, and thirty-four students. Although this shows a somewhat better position in this respect than that of a year or two back, it is far below what it should be, and has been, for I find that in 1882 there was a total of 246 members; in fact, as compared with the other Federated and non-Federated Mining Institutes, it should be, with the exception of the North of England and South Wales Institutes of Mining Engineers, unrivalled, not alone in point of members, but also as to financial status and number and character of the papers read and discussed at its meetings—such is our geographical position in relation to the mining areas of the Midlands, and such is the extent and character of the coalfields themselves, and, may I add, such are the human resources from which we can or should draw.

A DOMESTIC PROBLEM.

Now, how can we exalt the society to the great and commanding position which by right of locality and circumstances it should occupy in the mining world. As to the character of the papers and discussions, they compare favourably with those of any other mining societies; the papers might, however, be greater in number and the meetings more fully attended; the finances are merely the measure of the number of members, and the number of members is dependent on the individual exertions of each one of us—on our desire to promote the usefulness and well-being of the Institute. The number of gentlemen directly or indirectly interested in mining in the counties of Stafford, Worcester, Warwick, and Shropshire, who are not members of this or any other mining institute must be very considerable indeed. Now, if each one of us would essay to induce some of them to attach themselves to our Institute, and to prove to others of them the value of membership, by our individual earnestness in attending meetings, contributing to the reading and discussion of papers, and otherwise assisting in a spirited and ardent prosecution of the work of the society, I, for one, do not doubt that our efforts would be crowned with success, and the society would occupy that sphere of increased influence for good in the mining world which I am sure we all so desire that it should take.

Another matter has occurred to me, and one in close connection with the subject just alluded to, which is this: Are we, as an individual society, and the other branches of the Institute of Mining Engineers, benefited by the Federation? Permit a child for a moment to consider his position in relation to his guardian. In point of number of members and financial status, the Federated Institute has, without doubt, steadily improved since its inception in July, 1889, though the improvements in this respect may possibly be attributable to the natural increment due to time, and extension of the mining industry, but, doubtless, also, is in no small degree, to the fact that the combined societies are now generally known and regarded as the Institute of Mining Engineers, a title which presents to many outside the society an alluring inducement towards membership, for the title of M.I.M.E. *does* undoubtedly confer a certain amount of distinction and reputation on its owner, especially in the regard of those unacquainted with the ease with which it is acquired, and unaware of the fact that it does not necessarily imply any particular merit.

FUNCTIONS OF MINING INSTITUTES.

Of course, the original object of all these societies, and that which led to their formation, was the congregating of mining engineers to discuss coal mining affairs and practices of peculiar importance to the

locality, and, secondly, of mining engineering topics in general; but the Federation has, in large measure altered or, at any rate, modified this, and the individual Institutes no longer possess, in their old degree, "a local habitation and a name." I mean, that to some extent, their old individuality has been lost, not that their sphere of influence has been narrowed, or destroyed. Combination and extension are the order of the day, and it would almost appear that, in the case of the Federated Institute, this is as applicable as to other "combines." At present, the Institute of Mining Engineers occupies a peculiar position, for in destroying, in some measure, the individuality of what are now its sub-divisions, it has done so without so far acquiring much of its own.

If the combining societies are to fulfil their mission of usefulness in the mining world, one only of two courses is open to the Federation, viz.: (1) Either to dissolve into its original components, when, by a process of natural selection, the fittest will survive and expand; or (2) to proceed still further along the line of evolution so far followed, and still further extend its constitution, and become *the* Institute of Mining Engineers in meaning as well as in word. If the title of M.I.M.E. is to be regarded throughout the mining world as a designation of real importance of weight, and of honour, we must heighten the standard of admittance, and put the society on a footing equal in all respects with that of the Institute of Civil Engineers. What I now say may be regarded possibly as contradictory of my remarks anent the improvement of our own sub-society at the opening of my address, but a little thought will show that that is not so, the two cases are quite different. The status of the mining engineer in the eyes of the public is below that of the civil engineer, for membership of the Institute of Civil Engineers has come to be regarded of late years—since the policy I now hint at as being desirable in our own case was carried into effect—as bringing with it, and rightly so, considerable credit and repute.

The designation M.I.M.E. might be made a safeguard for the public, for, as matters are, its appearance behind the name of some unscrupulous person in a mining prospectus or report, brings discredit to us who so desire that the status of the mining engineers should stand above reproach, and be equal in distinction to that of any other body of applied scientists.

AMALGAMATION SUGGESTED.

Further, and this is the last question in our domestic policy, if I may use the term, that I shall allude to to-day. Could not some *modus vivendi* be arrived at as between the Institute of Mining Engineers and the Institute of Mining and Metallurgy of London, either in the way of amalgamation or of definition of spheres of operation? The latter society is doing extremely good work, its meetings are well attended, the papers, especially of late, are of an increasingly high standard, and the discussions animated and productive of good. It seems a waste of energy for these two societies to be working on more or less the same lines and yet to remain distinct.

THE DEEP MINING PROBLEM.

Passing now to matters of more technical import. The question of greatest consequence confronting us in this part of the Midlands is undoubtedly the problem of deep mining, and particularly that of the profitable working of a thick seam lying at great depth from the surface; for the last few years have seen the inauguration of the development of the mining tracts lying beyond the Eastern and Western boundary faults of the South Staffordshire coalfield, and the near future will undoubtedly witness a still further advance in these directions from the more or less exhausted areas of the exposed coalfield. Deeper mining will before long, also be carried out in North Staffordshire.

The subject of deep mining is a fascinating one to the mining engineer, and one which might well occupy the whole of my address to-day, but would not be exhausted by a library of books, nor in a year's discussion; but I cannot now do more than merely touch the fringe of the subject, trusting that any remarks which I may make will not be deemed out of place in view of the fact that the Royal Coal Commission has not yet issued its final report.

That part of the problem which relates to mechanical appliances does not, I think, present any insuperable obstacles. The difficulties in the way of winding from great depths, at least in so far as concerns depths down to 5,000 ft., have been satisfactorily solved, without resorting to the use of tapered ropes or stage winding. The Whiting system of hoist seems to meet requirements up to this depth at the Red Jacket (vertical) shaft at the Calumet and Hecla mine in Northern Michigan, U.S.A. And I am of the same opinion as Mr. Hennen Jennings, that with the adoption of the tail rope, in connection with this system, its usefulness would be much increased. Nor do I think we need be greatly concerned as to the difficulties in the way of the cheap and effective transmission of power to great depth or great distances underground. For, though in "fiery" coal seams, it may be most dangerous—injudicious, at any rate—to use electrically actuated coal cutters, there should be no objection to working air compressors by electric motors stationed some considerable distance along

the main intakes, and conducting the compressed air to the face. "Secondary" haulage could be similarly worked.

ELECTRICITY *VERSUS* COMPRESSED AIR.

When electricity first came to be applied to mining as a motive force, it was thought that the days of compressed air were numbered, but the fact was that we had neither been compressing nor using the air to the best advantage. Indeed, I remember a 25 per cent. efficiency being regarded as a good result. In reality, compressed air is of great advantage as a long distance transmitter of power. For nowadays, what with compound steam engines, isothermal compression (performing the work in separate cylinders with intermediate coolers—two or more stage compression) mechanical improvements such as the use of lever, lifted valves (of the Riedler type), instead of air-moved flaps (and so avoiding wire drawing), and adiabatic use—or reheating—of the air by electric or stove reheaters, very remarkable efficiency results have been obtained. For instance, the Paris Compressed Air Company, which deliver about 8,000 h.p. from two central stations through 35 miles of piping, the most distant motor being 4½ miles away, in 1889 were supplying their customers for one i.h.p. at the central engine with ·39 i.h.p. with cold air, and ·47 i.h.p. with reheated air just before entering the customer's motor; and it was shown in 1891 that, with stage compression and other improvements, still higher efficiencies might be obtained, viz., with cold air ·46, with hot air ·65, and if the hot air was sprayed with water, ·8, which results have since been in great measure attained. The beneficial results in the way of ventilation and the cooling—to some extent—of the mine atmosphere at the face by the extensive use of coal cutters actuated by compressed air, have only to be mentioned to be appreciated.

Perhaps the most difficult part of the problem of deep mining which we shall have to solve is that which relates to heat increment and ventilation, and that which is peculiar to coal mining—crush due to pressure of superincumbent shale. These are the main factors in the causes limiting the depth at which it will pay to mine.

TEMPERATURE OF DEEP MINES.

In respect to the question of temperature, though no very definite practical conclusions can be said to have been arrived at, the best and fullest information yet to hand is undoubtedly that contained within the pages of the minutes of evidence of the first and second reports of the Royal Coal Commission at present sitting, but based on such data as we do so far possess, I do not think any formula for determining the heat at any depth can be of any practical value. For instance, we find that at Pendleton Colliery, in Lancashire, the increase in the temperature of the air was only 28·5 deg. F. in a depth of 3,483 ft., that is to say, a gradient of 1 deg. F. for every 122 ft., whereas Professor Dixon stated that at the deep boring at Schladebach, the temperature at a depth of 5,630 ft. was 133·9 deg. F., which, taking as the starting point a temperature ot 51·8 deg.—the temperature at 118 ft.—would give an increment of 1 deg. F. for every 67·1 ft. The first instance is, however, much the more valuable as tending to show the probable temperature of the air under actual working conditions. I do not think we can take the data obtained from boreholes as helping us much in this direction. In the case of the Bezuidenville borehole on the Rand, the rise in temperature worked out at 1 deg. F. for every 208 ft. in depth over a depth of 3,251 ft. The "Turf Club" Syndicate began the boreholes before the war, and have completed them since the war. The west borehole cut the Reef series at 4,743 ft., and the east borehole at 4,825 ft.; experiments as to heat gradient have been made in the west borehole, though not to the full depth, and definite and conclusive results have not yet been obtained, but are not expected to be materially different to the results obtained in the Bezuidenville borehole"—so writes Mr. Hennen Jennings, of whom I had inquired. In 1895, at the Calumet and Hecla Copper Mine in Michigan, U.S.A., the increase was 1 deg. F. for every 223 ft. calculated over a depth of 4,580 ft., at which the temperature was only 72 deg. F. When I visited this mine, in 1902, the temperature in the Red Jacket vertical shaft, at a depth of 4,900 ft., was said to be 87·6 deg. F.

DEEPEST VERTICAL SHAFT IN THE WORLD.

It would be interesting to learn what was the temperature of the air at the bottom of the No. 3 shaft of the Tamarach Copper Mine, adjoining, as this is now the deepest vertical shaft in the world, being over 5,000 ft. in depth. Much has been made of the air temperatures in the Simplon tunnel, but, as affording data for guidance in the matter of temperature gradients in coal mining in this country, they are of little use in view of the fact that quite recently a spring of water of 700 to 800 gallons per minute, of a temperature of 113 deg. F. has been encountered in the tunnel. Nor has—any very great or definite result been the outcome, as yet, of the work of the Underground Temperature Committee of the British Association, which, since its appointment in 1867, has issued no less than twenty-two reports.

I, for one, welcome the suggestion put forward by Mr. Garforth, that the subject should be further investigated by a committee of mining engineers carrying out temperature observations in exactly the same manner all over the country; but I would further suggest that there be represented on such a committee one or more well-known geologists, as the question is in such close relation to geological conditions, and that the committee should work in line with similarly constituted committees on the Continent and in the Colonies.

The only points upon which we are certain in respect to heat gradients would appear to be: (1) that the local length of the geothermic degree is quite undecided; (2) that this length is different in different districts; (3) that isogeotherms are not parallel up to a depth of 5,000 ft.; and (4) I do not think we need apprehend any difficulty due to heat increment in working up to a depth of 4,000 ft. that cannot be overcome by sinking large shafts and causing great volumes of air to circulate through the workings, and, perhaps, by some modifications in our present modes of ventilation. Undoubtedly, some system of local or "secondary" ventilation will have to be resorted to, some arrangement whereby numerous splits of cool, fresh air shall be taken off one or more main intakes and circulated round only a circumscribed area of workings before being drawn to the surface.

VENTILATING DEVICES.

As emphasising this, take, for instance, the case quoted by Mr. Mitcheson as occurring at Florence Colliery, in North Staffordshire, though they have there face temperatures as high as 82·5 deg. F., some places are as cool as 73 deg. F., owing to the fact that there is a greater current of air traversing a limited length of face, in the instance in mind about 1,000 yards. "Helping-up" fans, driven either electrically or by compressed air, might also, with advantage, be placed in the return air ways near the face to give velocity to an otherwise sluggish air current, or to draw artificially-cooled air through pipes and distribute the same at the face. Some such devices as these may, I have no doubt, be satisfactorily worked out and adapted to the needs of deep mining. It should not, at any rate, be difficult to greatly increase the velocity of the ventilating current in the main intakes, this being chiefly a question of mechanical power.

We have seen that practically no difficulty of moment is being experienced in the working of the great copper-bearing conglomerate of the Lake Superior region at a depth of about 5,000 ft. from the surface, and that with an increase of temperature of 1 deg. in 200 ft. there is no reason why the temperature or pressure should, with a formation of solid sandstone, debar mining from being carried on in the Rand to a depth of at least 6,000 ft. But, though these instances go far to prove that mining can be carried on at great depth in metal mines, they do not help us towards a solution of the problem facing us in this part of the world, viz., how to profitably exploit a thick seam of coal lying at great depth from the surface, for the question of crush is of little account in the former case.

THE EFFECT OF PRESSURE.

The effect of pressure or tension, whichever it is, seems to be much more evident in the case of a thick than a thin seam. Thus, at Florence Colliery (North Staffordshire), where the depth from the surface of the deepest working seam is 2,577 ft., and the thickness of the seam but 5 ft. 6 in., the effect of the pressure, though more than noticeable, cannot be said to be great, whereas at Hamstead Colliery (South Staffordshire), where the "thick coal" lies at a depth of only 1,845 ft., and is 24 ft. thick, the effect is very marked indeed, more so, perhaps, than in any other known instance. Of course, the proximity of the faults may in some measure account for this, but it would almost seem as if the coal itself existed here in a state of considerable inherent tension, which would explain those sudden accessions of "creep," termed "bumps," which prove so troublesome in the working of the seam at this colliery—breaking up the roads and smashing the timber; bad as these are, they are not, perhaps, the worst results of pressure (tension is but the secondary effect of pressure), for, according to Mr. Meacham, the percentage of slack in working the coal at a depth of 2,100 ft. in South Staffordshire is no less than 65, as compared with 50 per cent. at a depth of 300 ft, and he estimates that at Hamstead (1,845 ft.) they lost, inasmuch as they had to leave it, 38 per cent. of the coal as compared with a 10 per cent. loss at 300 ft.

It has occurred to me that a partial prevention of these evils might be secured by the entire removal of some thin seams lying below the thick coal (say, in the case of Hamstead the "Heathen" coal, which is 24 ft. below the thick coal), working this out by long wall, and packing the workings with stone, before attaching the thick seam, maintaining the main roads in the lower and worked out seam, or, if such lower seam be one subject to gob fires, possibly the best plan would be to drive the main roads in some bed of fireclay or bind—which is in close proximity to the thick coal—to the boundary, and work the thick coal homewards. I am inclined to think the latter suggestion

has been actually tried. The capital necessary in both cases would be great, and the period that would elapse before any large return has been made would be long, but the ultimate result would surely be more satisfactory. But, on these points gentlemen who have had life-long experience in working the thick coal of South Staffordshire are far better fitted to advise me than I them.

THE STATUS OF MINING ENGINEERS.

But I must not, gentlemen, put any further strain upon your patience and good nature. Enough has been said, I think, to show that our profession is not the least important branch of engineering. Indeed, I know of no other calling, unless it be that of a medical practitioner, which makes so many and great demands upon one's intelligence, physical endurance, and moral strength, as that of mining engineer; for, besides being an all-round miner, he has to have more than an elementary acquaintance of the allied sciences and their applications, and being in daily contact with large bodies of workmen, has to learn to feel for while working with them. Indeed, he has to be possessed in no small degree of that estimable quality which we name tactfulness; and few men have to be more resourceful in dangerous emergencies.

Britain has been for years the cradle of great mining engineers; time was when others used to come to learn of us, but times are changing; we live in days of advancement, and we must move with the times or be left behind. Let us not be above learning when necessary from our friendly opponents. Let us learn to take a wide view of things, and not be content to follow in the old beaten track of this or that mining district.

INSTITUTION OF MINING AND METALLURGY.

At the meeting of this Institution yesterday, some interesting papers were read. Mr. Chas. Butters and Mr. E. W. Hamilton dealt with "Cyaniding of Ore at El Oro, Mexico," the paper dealing principally with the regrinding of sands. It is becoming apparent that many ores which have proved very refractory under all other methods of treatment, will yield excellent results by the cyanide process when reduced to a very fine state of division, and treated by slimes plant. Opinions differ as to the best method of producing fine sub-division, but the machine which seems to offer the greatest possibilities of usefulness in this direction is the tubular flint mill. The result of tests at El Oro was to show that if 50 per cent. of the entire product of the stamps be reground, such regrinding will result in an extra recovery of $2.01 per ton of ore entering the battery bins, or a profit of $1.74 per ton of ore.

A paper on the "Dry Crushing of Ores by the Edison Process," was submitted by Messrs. W. Simpkin and J. M. Ballantine, with notes by Mr. W. Fischer Wilkinson. Some years ago Mr. T. A. Edison became impressed with the possibilities of utilising low-grade iron ores by converting them into valuable high-grade iron concentrates by magnetic separation. The deposits experimented on contained an exceedingly small percentage of metallic iron—not more than 15 per cent. The paper only dealt with the crushing and grinding branch of the operations. The Dunderland iron ore deposits, containing about 40 per cent. of metallic iron, are being worked by the Edison process, and crushing rolls are being erected for Bolckow, Vaughan and Co. Experiments have also been made on banked gold ore of the Rand mines. The tests made appear to have yielded satisfactory results.

A paper was submitted by Mr. W. A. Caldecott on "The Finer Crushing of Banket Ore." It has long been known on the Rand that the richest material discharged from the cyanide plant was the spitzlutte concentrate residues contained encased gold, and that after finer reduction of this material further cyanide treatment much diminished the residual gold. In fact, very fine crushing of these residues enables fine metallic gold to be detected in the pan. These considerations led, some years ago, to the consideration of plans for finer crushing of the spitzlutte product before treatment. The degree to which reduction should be carried is still a matter for discussion. In general, it is likely that with a fully-developed system of regrinding banket ore, the total percentage recovery by amalgamation will exceed 70 per cent. of the original gold contents of the ore, and the present economic 90 per cent. recovery from all sources of the gold contents of 10 dwt. banket ore will be raised to 95 per cent., at an increased cost of less than half the additional 5 dwts.

The Institution has also issued a report on the "Causes and Prevention of Miners' Phthisis," by Dr. J. S Haldane, F.R.S., and Mr. R. Archer Thomas.

At the meeting of the Tramways and Light Railways Association yesterday, Mr. John I. Hall submitted a paper on "Automatic Regenerative Control for Electric Traction." He pointed out the advantages of the Regenerative system over the Series Parallel system. One important distinction lies in the fact that under the former system the cars supply a part

of the power ; and the paper pointed out the advantage of the Regenerative system in hilly districts, where there is heavy current consumption. The writer claimed that in Raworth's system, an average of 25 per cent. in reduction can be obtained in operation. The erratic action of Series Parallel motors was criticised in comparison with the regenerative machine, which obviates the necessity for calling upon the engines to take up constantly varying loads. In no branch of electric traction, however, will Regenerative Control have, it is claimed, such far-reaching effects as in railway operations.

Staffordshire Iron and Steel Institute.

In his presidential address at Dudley, on Saturday last, Mr. H. B. Toy alluded to the question of protection. Reasonable arguments, he said, might be advanced for and against, but he had a strong conviction that a sudden reversal of the policy under which the nation had maintained such a supreme position would be attended with very great danger. That we were suffering from the effects of foreign competition no one could deny; but the real cause was our adherence to antiquated methods. Protection would not allow us to close our doors to foreigners and open theirs to us. They did not hear what proposals were forthcoming with regard to the pig-iron dumped in England by the Colonies. He thought the State might beneficially interfere in the direction of reduced railway and canal rates and cheaper coal. He complained, further, that British coal owners should be exporting 4,000,000 tons of coal per month at cheaper rates than they charged to our own manufacturers, thus supplying the foreigner with a rod with which to beat us.

The autumn meeting of the Institution of Heating and Ventilating Engineers was held on Tuesday at the Holborn Restaurant. Mr. J. S. Palmer presided. Papers were read by Mr. H. H. Grundy on "The Warming of Public Buildings by the Warm Air System" ; and by Mr. A. H. Barker on "The Testing of Large Engineering Plants." A discussion on "Boilers" was opened by Mr. Louis F. Pearson. Mr. G. Crispin was elected President for the ensuing year.

The annual dinner of the Incorporated Institute of Marine Engineers was held at the Great Eastern Hotel, Liverpool Street, on Wednesday evening.

The address of the Civil and Mechanical Engineers' Society has been changed to 25, Victoria Street, Westminster.

The Late Professor Thurston.

In a paper read before the American Institute of Mining Engineers, Mr. R. W. Raymond pays a tribute to the memory of the late Professor Thurston —the "magnetism of his mere presence, the enthusiasm of his sympathetic interest, and his infectious joy in the pursuit of knowledge." Says Mr. Raymond :—

"Whatever may be generally the best order in the stages of technical education—whether shop training should precede, accompany, or follow school study—I think that to mechanical engineers, at least, actual familiarity with machinery is an invaluable preparation for the comprehensive study of theory.

"Certainly, young Thurston was no exception to this rule. He added to his preliminary training a course in the scientific department of Brown University, graduating in 1859, at the age of twenty, as Bachelor of Philosophy, and returning as consulting and designing engineer to his father's business.

In 1861 he entered the U.S. Navy as an assistant engineer, and served until the close of the war of the rebellion, being attached to the fleets of Dupont and Dahlgren, and, in 1864, commissioned as first assistant engineer in the Steam Engineering Corps. At the close of the war he was sent as acting-assistant Professor of natural philosophy to the U.S. Naval Academy at Annapolis, where he remained until June, 1871. In that year the Stevens Institute of Technology was opened at Hoboken, N.J., and, through the wise judgment of Henry Morton, its distinguished first president, Thurston was called to the chair of mechanical engineering in that institution, the reputation of which, as well as his own reputation, was greatly advanced during the fourteen years of his professorship by his work as an instructor, investigator, and contributor to technical literature.

"In 1885 he became director of the new Sibley College of Engineering at Cornell University, Ithaca, N.Y., a position which he retained to the end.

His literary activity was intense and continuous, and he also found time to acquire some reputation as an inventor, chiefly in connection with his extensive work in original investigations. His oil-testing machines and his torsion-testing machines are most familiar to engineers ; but he also made inventions in magnesium-burning lamps, signal apparatus for the army and navy, various machines for testing the properties of iron and other metals, and for ascertaining the properties of lubricants, and in addition to this work he made improvements in steam engines and in existing scientific apparatus."

PAGE'S WEEKLY

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New Copy for Advertisements,

Alterations, &c., intended for insertion in the current week's issue must be delivered **not later than 4 p.m. on Monday.** If proofs are required the copy and blocks should reach us several days earlier.

OFFICIAL NEWS RECORD.

Appointments.

Mr. James Dalrymple, who during the last three years has acted as deputy-manager of the Glasgow Corporation Tramways, has, in accordance with general expectation, been appointed to succeed Mr. Young as general manager of that important system. Mr. Dalrymple has had ten years' service with the Corporation, having joined its service originally in the capacity of accountant, and in announcing his appointment as general manager, the Chairman of the Tramways Committee made a flattering reference to Mr. Dalrymple's abilities.

Mr. Walter T. Kerr, assistant electrical engineer at the Crewe Corporation electricity works, has been appointed to the Hereford Corporation electricity works at a salary of £250 per annum.

Mr. Fred C. Gibbon, M.I.E.E., has returned to Messrs. Browett, Lindley and Co., Ltd., under agreement for a long period as sole managing director.

Mr. L. Slattery, general manager of the Blackpool, St. Anne's, and Lytham Tramway Company, has been appointed by the Oldham Corporation general manager of the tramways at a salary of £300 per annum.

Captain T. E. Sargent to be superintendent of the Mercantile Marine Office, Liverpool. The Mersey port is one of the few where this office is held by a Master Mariner.

Messrs. W. T. Harbord and F. Schoeberlein have been appointed Assistant Civil Engineers in the Admiralty Department of the Director of Engineering and Agricultural Works.

Obituary.

The death of Mr. George Benham Stacey removes one of the few remaining pioneers of submarine cable working. Mr. Stacey was born in 1839, and in 1851 he entered the service of the Electric Telegraph Company. Two years later he was transferred to The Hague on the laying of the first cable to Holland, and was afterwards sent to the Prussian Government telegraph office at Berlin, whence he was transferred in 1856 to the Foreign Gallery, London. From 1857 to 1859 he was in the Egyptian Transit Administration, and in 1860 he joined Messrs. Glass and Elliott's cable works at Greenwich (afterwards the Telegraph Construction and Maintenance Company). On the laying of the first Malta—Alexandria cable Mr. Stacey was appointed to Benghazi, and became superintendent in 1863. After service in Malta, he became, in 1868

superintendent of the Anglo-Mediterranean Telegraph Company's Susa-Modica landline through Italy, and agent to the Italian Government. Then for twenty-eight years, until 1897, he was superintendent and afterwards manager at Bombay of the British-India Submarine Telegraph Company (afterwards the Eastern Telegraph Company). Mr. Stacey was recognised for a self-reliant able administrator.

The late Mr. John Hollingshead won distinction in many directions, but in technical circles he will best be remembered as one of the pioneers in the use of electric light in London.

Mr. Archer Brown, of the firm of Rogers, Brown, and Co., died rather suddenly at New York. Starting life as a reporter in Cincinnati, he afterwards associated himself with the pig-iron industry and became one of the best known men in the trade, being at the time of his death associated with a score of companies. He was only fifty-three years of age, but had lived a somewhat strenuous life.

The death is announced of Mr. W. Ford-Smith, who founded the firm of Smith and Coventry, of the Gresley Iron Works, Manchester.

Partnerships Dissolved.

Dissolution of the following partnerships has been announced during the past week :—

Wm. Liversidge and Sons, Selby, Yorks., timber, iron and general merchants. The business will be continued by W. and T. Liversidge.

Davies and Netherwood, automobile, motor-cycle, and general engineers, Harrogate.

Runton and Thompson, Castle-street, Kingston-upon-Hull, engineers.

Dundas and Seton, 119, Pall Mall, S.W., automobile agents.

Smith and Huntsworth, 180, Regent-road, Liverpool, electrical engineers.

Schoen Bros., 29, Cock-lane, Snow Hill, E.C., agents for electrical fittings.

Hands Bros., 30 and 34, Snow Hill, E.C., electrical engineers.

Wm. Stevens and Co., Bowling-green, Dudley, chain manufacturers. Thos. Stevens and Frank Stevens will continue the business.

Company Reports and Meetings.

The twenty-first ordinary general meeting of the Edison and Swan Electric Light Company was held on Monday. Mr. Henry Wolfenden presided, and in moving the adoption of the report said that the sales and earnings this year showed an increase when compared with those of the previous year. The quality of their manufactures and the costs were alike favourable, and their financial position continued to improve. They had, however, still to contend with an active competition, but they were quite prepared to meet it, and the directors' confidence in the future remained unabated. The balance brought from profit and loss account was £42,603, showing an increase on the previous year's figures of £11,768. Stocks had been valued on a conservative basis, and £5,000 representing about 6½ per cent., had been allowed for depreciation of plant. The credit balance amounted to £8,891. The writing down of capital had not sufficed to wholly extinguish the debit balance, a sum of £3,589 having to be provided for, which left £5,302 to be carried forward. The report was adopted.

The report of the Enfield Cycle Company states that the net profit for the year ended August 31st, 1904, is £11,430 16s. 4d., and £3,881 6s. 4d. was brought forward. The directors recommend a dividend of £5 per cent. (free of income-tax) on the ordinary shares for the twelve months; a transfer to reserve fund of £3,000, carrying forward £5,648 2s. 10d.

The report of the Underground Electric Railways Company of London states that the construction works which are being carried out by the company have made satisfactory progress since the date of the last report. The power-house is nearing completion, and three-quarters of the machinery has been delivered, including two of the turbo-generators, which are now being erected, and it is expected that tests of the machinery will be made during the months of October and November. It is proposed to take authority to raise £850,000 on the security of the power-house. Satisfactory progress has been made in the conversion of the Metropolitan District Railway for operating by electricity, and the principal construction work is nearly finished. The Chairman at the meeting stated that it was hoped to have trains running between Ealing and the Mansion House by January 1st next.

The Albert-Eadie Chain Company is paying a dividend of 6 per cent., and, at the same time, proposes to change its name to Ecco Works, Ltd.

Richardson, Westgarth, and Co.'s profits for the year ended August 25th last, amounted to £74,503, and the available balance is £91,885. The final dividend is at the rate of 6 per cent. per annum, which was the rate paid for the first half of the financial year.

The Bwllfa and Merthyr Dare Steam Collieries recommend dividends at the rates of 12 per cent. per annum on the preference, and 35 per cent. per annum on the deferred shares, with a further dividend of 12½ per cent. on the latter out of a sum held in reserve.

The Anglo-American Telegraph Company has declared an interim dividend for the quarter ended

September 30th of 12s. 6d. per cent. on the ordinary, and £1 5s. per cent. on the preferred stock (less tax), payable November 1st. A sum of £5,000 has been placed to the credit of the renewal fund.

The South Lancashire Electric Traction and Power Company is to be wound up for the purposes of reconstruction.

The Vulcan Foundry Company has announced a dividend of 6 per cent. for the year ended June 30th.

The Ingersoll Sergeant Drill Company has declared an interim dividend of 1s. per share on the ordinary.

The accounts of Baldwins, Ltd., show a profit for the year ended June 30th last of £68,856. Against this sum the following charges have been made: £10,290 for income tax, debenture stock, trustees' fees, directors' fees, and managing directors' remuneration, solicitors' and auditors' charges, etc., £16,794 for expenditure on alterations and improvements, and £10,000 for depreciation. The payment of premiums on sinking funds for the redemption of leaseholds and debenture stock absorbs £5,629, and payment of the debenture interest £11,250. The amount required for the preference dividend is £13,750. To the balance thus left of £1,141 has to be added the sum of £11,145 brought forward from last year, making a total of £12,287 to be carried forward to the credit of the current year's account.

The report of Ibbotson Bros. and Co. shows profits of £18,281. The balance dividend of 10 per cent. makes the total for the year 7½ per cent.

Launches.

Wednesday last witnessed the launching of the *Patrol*, the second of the two scouts being built by Cammell, Laird, and Co., at Birkenhead. The ceremony of naming the boat was performed by Mrs. MacGill, wife of Captain T. MacGill, C.B., Captain-Superintendent of Contract-Built Ships.

It is reported that the *Carmania*, the 21,000-ton turbine steamer which is being built by John Brown and Co., Clydebank, on which is was understood the work was well forward, will not be launched this year.

The twin-screw icebreaker, *Montcalm*, was launched on Saturday last from the shipbuilding yard of Messrs. Napier and Miller. It has been built for the Canadian Government for work on the St. Lawrence, to the order of Messrs. Fleming and Ferguson, Ltd., of Paisley, who are supplying the machinery. The chief dimensions of the new boat are—length, 245 ft.; breadth, 40 ft. 6 in.; depth, 18 ft.; and the gross tonnage is about 1,350 tons. In order to fit the vessel for its particular work, the steel plating at the bow and in other parts is of double thickness with intermediate framing extending fore and aft. The propeller, rudder, keel, stem, and stemport are of nickel steel of extra strength, and the rudder is protected by a cast-steel knife, which is also used for the purpose of breaking ice when working astern. Captain M. P. McElbinney, nautical adviser to the Canadian Government, is responsible for the design.

Contracts.

WEST HAM.—Thirty-five double-deck tramcars with electrical equipment.

HEATON MOOR.—Supplying and fixing six b.h.p. gas engines, pumps in duplicate, pipes, valves, etc., for the Heaton Moor's Urban District Council. Mr. Walter Banks, Council Offices, Heaton Moor, October 31st.

BUXTON.—Valves, sluices, filters, and meter, miscelleaneous iron work, etc. Messrs. G. H. Hill and Sons, civil engineers, Albert Chambers, Albert Square, Manchester, November 5th.

RICHMOND (SURREY).—The Guardians invite tenders for the installation of electric telephones at the workhouse, Grove Road. October 27th.

SWANSEA.—Removal, alteration, and re-erection of a 450-i.h.p. triple-expansion engine and a 225-kw. continuous current dynamo. Also an eight-ton travelling hand crane, for the electricity department. November 12th.

TAMWORTH.—Offers for the construction and maintenance of electric lighting works are invited by the Corporation.

NORTHAMPTON.—Steam coal for the Corporation tramways. October 24th.

PRESTON.—Motors and tramway boosters for the Tramways Committee. November 9th.

GARLANDS, Carlisle.—Electrical Works. November 1st.

CHATHAM.—Supply and fixing of 170 yds. lineal continuous wrought-iron fencing for the Corporation. October 27th.

NEWCASTLE-ON-TYNE.—New iron piers for Markets Committee. October 26th.

MANCHESTER.—Erection and completion of the steel structure portion of gasometer depots for the Gas Committee. October 21st.

MEETINGS FOR THE ENSUING WEEK.

FRIDAY, OCT. 21.—The Institution of Mechanical Engineers hold the first Monthly General Meeting of the coming session in the Institution House, Storey's Gate, S.W., at 8 p.m. Paper, "A Scientific Investigation into the Possibilities of Gas, Turbines," Mr. R. M. Neilson.—North-East Coast Institution of Engineers and Shipbuilders. Twenty-first Annual Meeting in the Lecture Theatre of the Literary and Philosophical Society, Newcastle-on-Tyne, at 7.30 p.m.

SATURDAY, OCT. 22.—Manchester Association of Engineers. Paper, "The Temperature, Eutropy Diagram," Mr. G. J. Wells.

MONDAY, OCT. 24.—Institute of Marine Engineers. Paper, "Technical Education," and Discussion, at 8 p.m.

TECHNICAL PUBLICATIONS OF THE WEEK.

"BEST METHOD OF SEWAGE DISPOSAL FOR SMALL COMMUNITIES."

As adopted by H.M. War Department and numerous Public and Private Bodies. By. F. Wallis Stoddart. John Wright and Co. (Bristol). 6d. or in boards 1s.

A useful illustrated pamphlet, in which the author gives, in a concise form, details of the continuous sewage filter, etc.

"THE MANAGEMENT OF ELECTRIC TRAMWAYS AND LIGHT RAILWAYS."

By William R. Bowker, C.E. E. and F. N. Spon, Ltd. 9s. net.

The compiler of this thoroughly practical treatise on electric traction, writes from actual experience, the result being a work which should prove a valuable auxiliary to all tramway and light railway officials. Mr. Bowker, who is a consulting electrical and tramway engineer, deals with his subject from a commercial and economic standpoint. He is of opinion that the attainment of the maximum revenue with a minimum of expenditure should be the desire of every authority responsible for the working and administration of electric tramways. The organisation of the various departments having been amply discussed, with this end in view, the writer proceeds to consider the possibilities of light railways. He claims that the light railway has a field of its own, with distinctive aims and methods, in no wise antagonistic to main line enterprise. On the other hand, it is calculated, by opening up fresh country, to increase the traffic and promote the general interests of the main lines. An important section of the work is devoted to Financial Reports, Tramway Accounts, Estimates of Costs, Specifications, and Board of Trade Regulations.

CATALOGUES.

Mr. Ed. Brand, M.E. of 35, Shakespeare Street, Manchester, sends us a leaflet, drawing attention to American Automatic Wire-Straightening and Cutting Machinery and Automatic Sheet Metal Straightening and Cutting Machinery, for straightening and cutting wire and sheet metal to accurate lengths direct from the coil.

Alley and MacLellan, Ltd., of Polmadie, Glasgow, by means of a folding illustrated sheet, draw attention to their S22 168 page catalogue, including prices, weights, dimensions, photos and drawings of over 1,000 sizes and patterns of steam valves and fittings; also notes on steam pipe design, etc. A copy of this catalogue will be sent free on request to engineers, merchants, and steam users.

The Stirling Company, 53, Deansgate Arcade, Manchester. Pamphlet No. 13 is entitled "The Utilization of Waste Heat from Coke Ovens," and sets forth the advantages of the Stirling Water-Tube Safety Boiler for this purpose. The frontispiece shows this form of boiler fired by waste gases from coke ovens at the Victoria Garesfield Colliery, Newcastle, and a useful comparison is made between the results obtained from Lancashire and Stirling boilers under similar conditions.

A Leaflet issued by Mr. Fred. J. Down, M.I.E.E., F.C.S., A.M.Inst.C.E., of 6, 7, and 8, Crutched Friars, London, E.C., gives prices and description of Guy Anchors, for staying poles for overhead telegraph, telephone, electric traction, or power circuits, etc. These screw anchors are made in six sizes, from 3½ in. to 12 in. in diameter, holding strains from five to sixty tons respectively. It is claimed that the largest size takes about twenty minutes to instal and that they are equally convenient for staying large iron chimneys, pile drivers, derricks, trees, fences, etc.

The British Aluminium Company, Ltd., of 9, Victoria Street, Westminster, S.W., forward us lists of a few users of aluminium wire for electrical power transmission purposes in England, on the Continent, and in America; also price list of (1) Pure aluminium; (2) Pure aluminium and light aluminium alloys (rolled metal); (3) Pure aluminium and light aluminium alloys (rolled rods and bars). We have also received a very useful sheet of tables of standard wire gauge, and its equivalent in inches and millimetres, and weight per square foot in sheet aluminium, brass and copper; dimensions and weights of aluminium and copper wire; and weight in pounds per foot of aluminium tubing. outside measurement, Birmingham Wire Gauge.

The subject of sewerage and sewage disposal is fully dealt with in a volume issued by Messrs. Adams-Hydraulics, Ltd., of Scotswood-on-Tyne. The work is divided into the following sections: Automatic sewage lifting, sewage purification, sewer flushing, and a catalogue of sewerage ironwork, penstocks, valves, etc. Its value is enhanced by numerous half-tone blocks and diagrams, showing the application of Adams' Patent Apparatus to different representative systems. All who are interested in the subject would do well to secure a copy of this work.

PAGE'S WEEKLY — Condensing Plant

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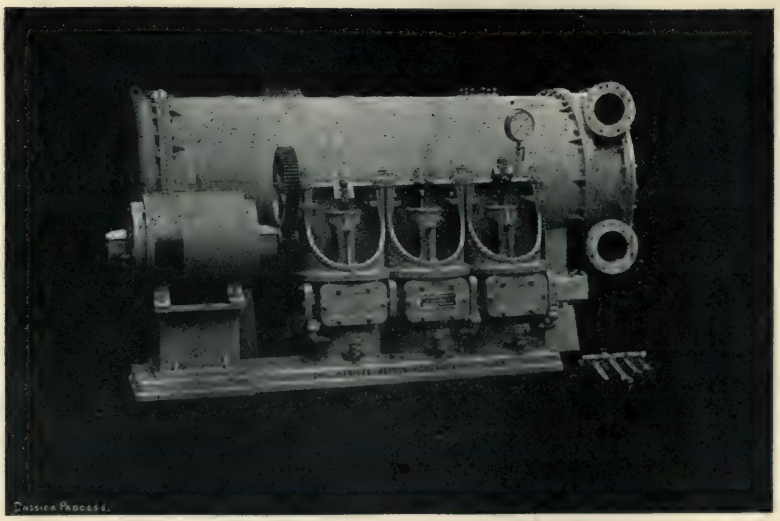

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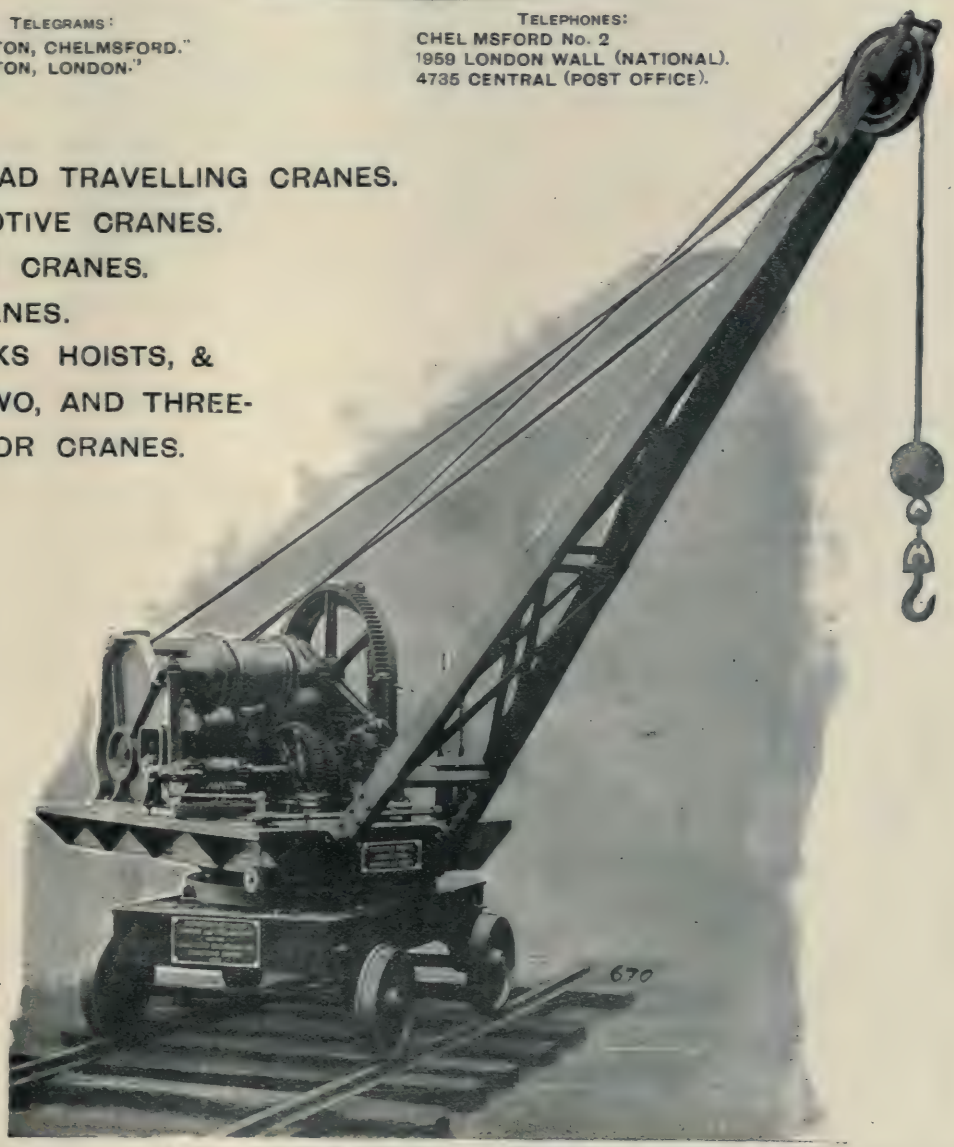

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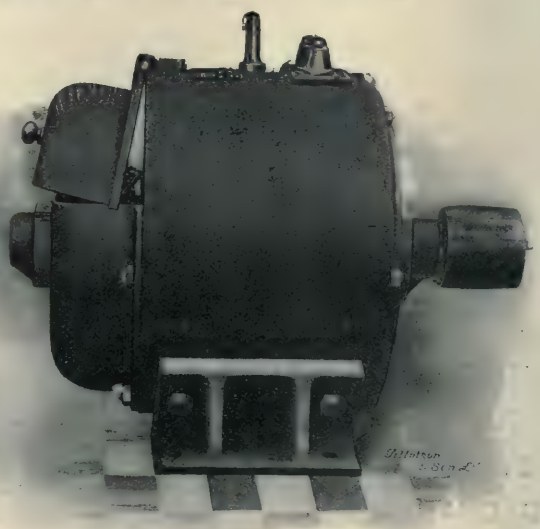

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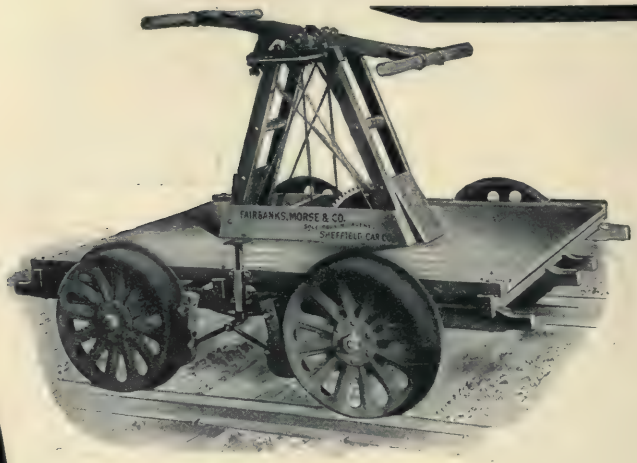

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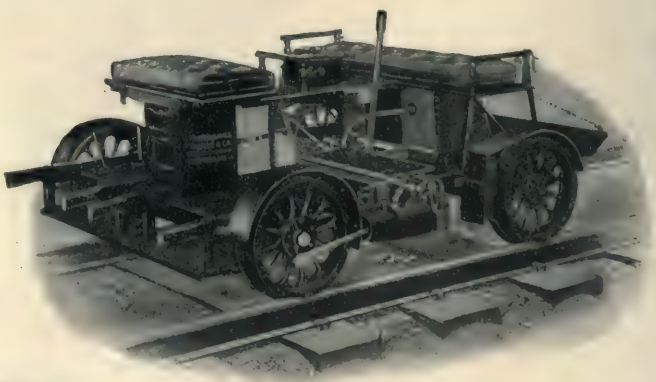
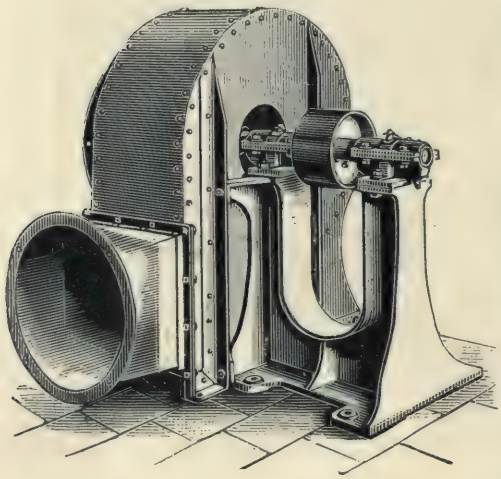


PAGE'S WEEKLY Electrical Apparatus



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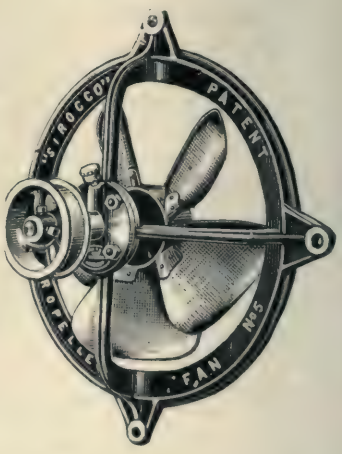

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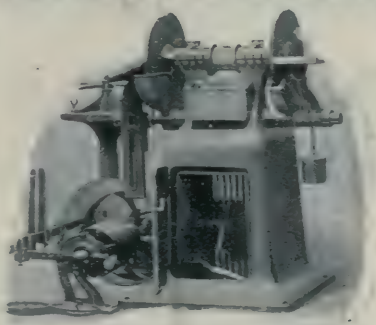

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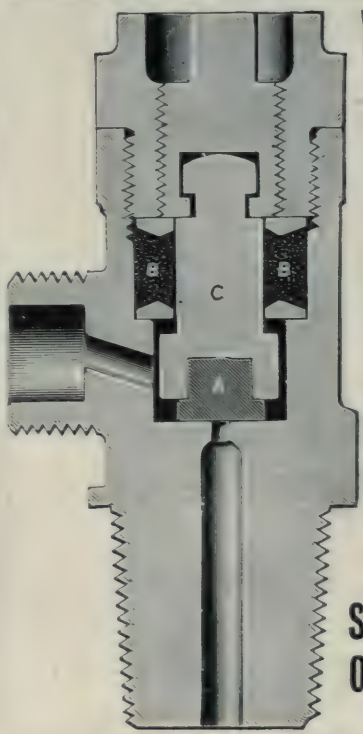

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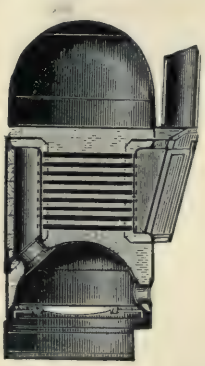

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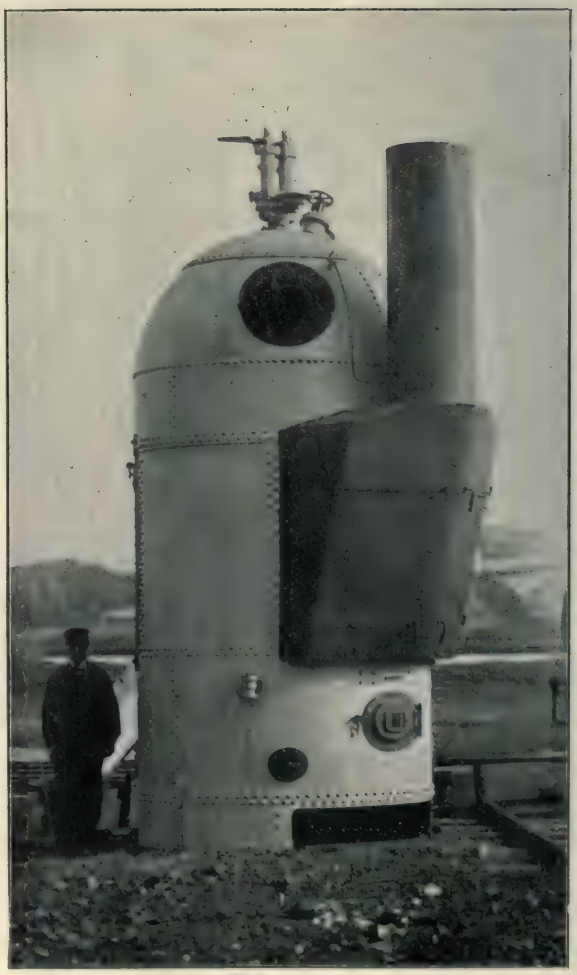

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Is constructed of Wrought Mild Steel.

Is suitable for 200 lb. Working Pressure, p.s. in.

Has an Improved Pressed Steel Box, and "Field" Tubes.

The Tubes are divided into two sections.

The steam circulates, in a thin film, **twice** over the heating surface.

The final temperature of outgoing steam is uniform, and regularly about 550° Fahrenheit.

The Box and Cover are always alike in temperature.

The joint never leaks.

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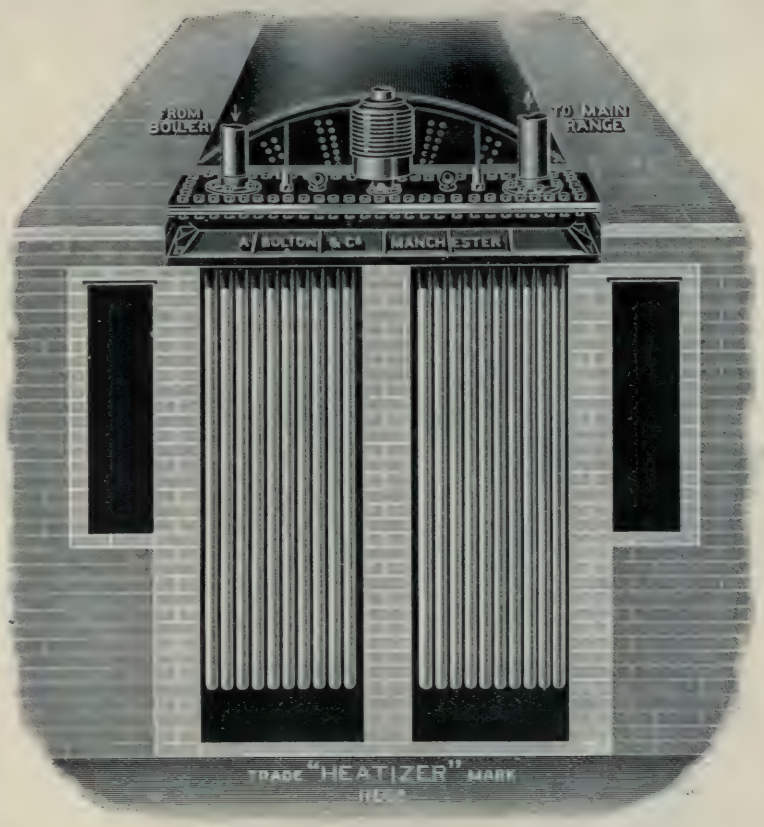

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Regenerative and recuperative system.

Output 30 to 200 tons per day of twelve hours.

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Economy of Fuel: 50 per cent.

Great Reduction of Waste.

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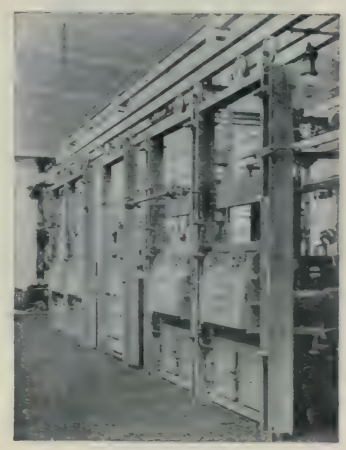

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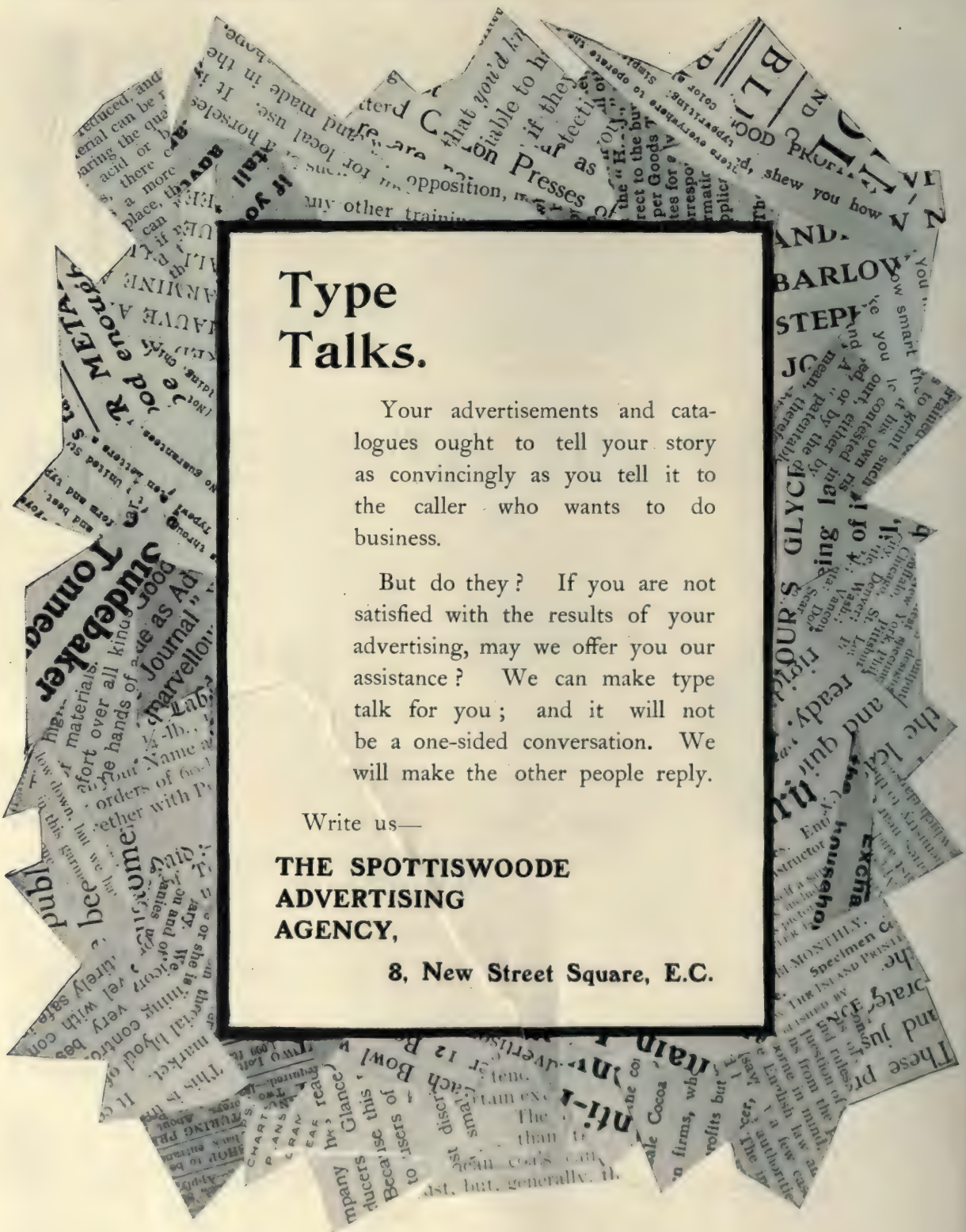

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PAGE'S WEEKLY

Miscellaneous

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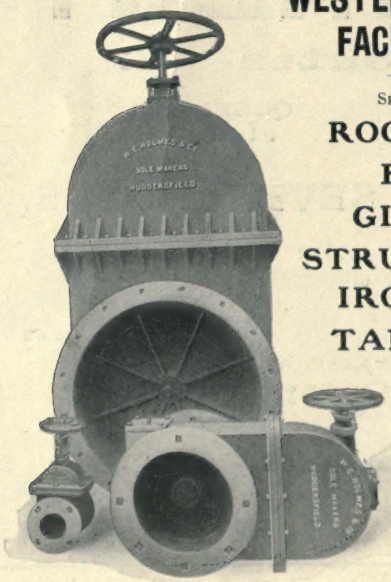

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